```
FILE 'HOME' ENTERED AT 14:05:09 ON 04 NOV 2003

=> file caplus
COST IN U.S. DOLLARS                               SINCE FILE      TOTAL
                                                        ENTRY    SESSION
FULL ESTIMATED COST                                      0.63       0.63

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FILE COVERS 1907 - 4 Nov 2003  VOL 139 ISS 19
FILE LAST UPDATED: 3 Nov 2003  (20031103/ED)

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=> file reg
COST IN U.S. DOLLARS                               SINCE FILE      TOTAL
                                                        ENTRY    SESSION
FULL ESTIMATED COST                                      0.42       1.05

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DICTIONARY FILE UPDATES:   3 NOV 2003  HIGHEST RN 612478-18-9

TSCA INFORMATION NOW CURRENT THROUGH JULY 14, 2003

  Please note that search-term pricing does apply when
  conducting SmartSELECT searches.

Crossover limits have been increased.  See HELP CROSSOVER for details.

Experimental and calculated property data are now available.  See HELP
PROPERTIES for more information.  See STNote 27, Searching Properties
in the CAS Registry File, for complete details:
http://www.cas.org/ONLINE/STN/STNOTES/stnotes27.pdf

=> s 2/Sc and 3/O
           961 2/SC
       3391526 3/O
L1          54 2/SC AND 3/O

=> s 2/Y and 3/O
```

```
         4775 2/Y
      3391526 3/O
L2       1805 2/Y AND 3/O

=> s 2/Al and 3/O
        15014 2/AL
      3391526 3/O
L3       3972 2/AL AND 3/O

=> s 1 or 2 or 3
     14105704 1
     15966710 2
     12591339 3
<------User Break------>

SYSTEM LIMITS EXCEEDED - SEARCH ENDED
The search profile you entered was too complex or gave too many
answers.  Simplify or subdivide the query and try again.  If you have
exceeded the answer limit, enter DELETE HISTORY at an arrow prompt
(=>) to remove all previous answers sets and begin at L1.  Use the
SAVE command to store any important profiles or answer sets before
using DELETE HISTORY.

=>
=> s l1 or l2 or l3
L4       5761 L1 OR L2 OR L3

=> file caplus
COST IN U.S. DOLLARS                               SINCE FILE      TOTAL
                                                        ENTRY    SESSION
FULL ESTIMATED COST                                     26.12      27.17

FILE 'CAPLUS' ENTERED AT 14:08:34 ON 04 NOV 2003
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FILE COVERS 1907 - 4 Nov 2003  VOL 139 ISS 19
FILE LAST UPDATED: 3 Nov 2003  (20031103/ED)

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=> s l4 and (fuel cell)
       275838 L4
       322449 FUEL
      1708205 CELL
        36093 FUEL CELL
                (FUEL(W)CELL)
L5       2771 L4 AND (FUEL CELL)

=> 5 and stabilized
```

```
5 IS NOT A RECOGNIZED COMMAND
The previous command name entered was not recognized by the system.
For a list of commands available to you in the current file, enter
"HELP COMMANDS" at an arrow prompt (=>).

=> s l5 and stabilized
        139572 STABILIZED
L6        1448 L5 AND STABILIZED

=> file reg
COST IN U.S. DOLLARS                              SINCE FILE      TOTAL
                                                       ENTRY    SESSION
FULL ESTIMATED COST                                     6.42      33.59

FILE 'REGISTRY' ENTERED AT 14:10:21 ON 04 NOV 2003
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Crossover limits have been increased.  See HELP CROSSOVER for details.

Experimental and calculated property data are now available.  See HELP
PROPERTIES for more information.  See STNote 27, Searching Properties
in the CAS Registry File, for complete details:
http://www.cas.org/ONLINE/STN/STNOTES/stnotes27.pdf

=> s 1/Ce and 2/O
         38017 1/CE
       4287765 2/O
L7        1704 1/CE AND 2/O

=> s l1 and l3 and l7
L8           0 L1 AND L3 AND L7

=> s l1 or l3 or l7
L9        5724 L1 OR L3 OR L7

=> file caplus
COST IN U.S. DOLLARS                              SINCE FILE      TOTAL
                                                       ENTRY    SESSION
FULL ESTIMATED COST                                     8.84      42.43

FILE 'CAPLUS' ENTERED AT 14:11:07 ON 04 NOV 2003
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FILE COVERS 1907 - 4 Nov 2003  VOL 139 ISS 19
FILE LAST UPDATED: 3 Nov 2003  (20031103/ED)

  This file contains CAS Registry Numbers for easy and accurate
  substance identification.


=> s l9 and (fuel cell)
        265528 L9
        322449 FUEL
       1708205 CELL
         36093 FUEL CELL
                 (FUEL(W)CELL)
L10       1747 L9 AND (FUEL CELL)

=> s l10 and (zirconia (p) stabilized)
         59944 ZIRCONIA
        139572 STABILIZED
         15047 ZIRCONIA (P) STABILIZED
L11        326 L10 AND (ZIRCONIA (P) STABILIZED)

=> s l11 and cermet
          9075 CERMET
L12         40 L11 AND CERMET

=> d l12 1-40 ibib ab kwic
```

L12 ANSWER 1 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2003:401574 CAPLUS

DOCUMENT NUMBER: 139:137219

TITLE: Electrodeposition of ceramics and ceramic composites for **fuel cell** applications

AUTHOR(S): Zhitomirsky, I.; Petric, A.

CORPORATE SOURCE: Department of Materials Science and Engineering, McMaster University, Hamilton, ON, L8S 4L7, Can.

SOURCE: Surface Engineering: Coatings and Heat Treatments, Proceedings of the 1st ASM International Surface Engineering Congress and the 13th International Federation for Heat Treatment and Surface Engineering Congress, Columbus, OH, United States, Oct. 7-10, 2002 (2003), Meeting Date 2002, 646-651. Editor(s): Popoola, Oludele O. ASM International: Materials Park, Ohio.
CODEN: 69DYAM; ISBN: 0-87170-781-0

DOCUMENT TYPE: Conference

LANGUAGE: English

AB Cathodic electrodeposition techniques were developed and utilized for deposition of ceramic materials for application in solid oxide fuel cells (SOFCs). Ceramic coatings of .ltoreq.100 .mu.m thickness were prepd. by electrophoretic deposition (EPD) or electrolytic deposition (ELD). Advanced bath compns. were developed for EPD of electrode and electrolyte materials such as yttria **stabilized zirconia** (YSZ), Ce1-xGdxO2-y (CGO) La0.8Sr0.2Ga0.875Mg0.125O3-x (LSGM), La0.8Sr0.2Co0.2Fe0.8O3-x (LSCF) and (La0.8Sr0.2)0.98MnO3-.vdelta. (LSM). The use of the common solvent-dispersant-binder system enabled EPD of consecutive layers of different materials. Electrolytic deposition has been utilized for deposition of thin layers of YSZ, CGO, LaCrO3, CaMnO3 and CeO2 for possible applications as **fuel cell** electrolytes, high temp. protective coatings or barrier layers for

prevention of electrode/electrolyte degrdn.
REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Electrodeposition of ceramics and ceramic composites for **fuel cell** applications

AB Cathodic electrodeposition techniques were developed and utilized for deposition of ceramic materials for application in solid oxide fuel cells (SOFCs). Ceramic coatings of .ltoreq.100 .mu.m thickness were prepd. by electrophoretic deposition (EPD) or electrolytic deposition (ELD). Advanced bath compns. were developed for EPD of electrode and electrolyte materials such as yttria **stabilized zirconia** (YSZ), Ce1-xGdxO2-y (CGO) La0.8Sr0.2Ga0.875Mg0.125O3-x (LSGM), La0.8Sr0.2Co0.2Fe0.8O3-x (LSCF) and (La0.8Sr0.2)0.98MnO3-.vdelta. (LSM). The use of the common solvent-dispersant-binder system enabled EPD of consecutive layers of different materials. Electrolytic deposition has been utilized for deposition of thin layers of YSZ, CGO, LaCrO3, CaMnO3 and CeO2 for possible applications as **fuel cell** electrolytes, high temp. protective coatings or barrier layers for prevention of electrode/electrolyte degrdn.

ST electrodeposition **fuel cell** coating ceria zirconia heat resistant; electrophoretic deposition **fuel cell** coating ceria zirconia heat resistant

IT Cermets
(Ni-yttria **stabilized zirconia**; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT Adhesion, physical
Ball milling
Ceramic coatings
Ceramic composites
Ceramics
Electrodeposition
Electrodes
Electrolytes
Electrophoretic deposition
Microstructure
Strength
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT Adsorption
(of polymers; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT Fuel cells
(solid oxide; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT Molding
(tape-casting, of **cermet** substrates; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 27360-07-2
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(binder; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 76688-72-7D, Emphos PS 21A, esters
RL: MOA (Modifier or additive use); USES (Uses)
(dispersant; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 9002-98-6, Polyethylenimine 26062-79-3, Poly(diallyldimethylammonium chloride)
RL: MOA (Modifier or additive use); USES (Uses)
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 64-17-5, Ethanol, uses 67-63-0, Isopropanol, uses

RL: NUU (Other use, unclassified); USES (Uses)
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT **1306-38-3P**, Cerium oxide (CeO_2), preparation 12017-94-6P, Chromium lanthanum oxide ($CrLaO_3$) 55575-02-5DP, Cerium gadolinium oxide, oxygen-deficient 59707-46-9P, Lanthanum manganese strontium oxide 114168-16-0P, Yttrium zirconium oxide ($Y_{0.16}Zr_{0.92}O_{2.08}$) 148595-69-1DP, Cobalt iron lanthanum strontium oxide ($Co_{0.2}Fe_{0.8}La_{0.8}Sr_{0.2}O_3$), oxygen-deficient 239467-10-8DP, Gallium lanthanum magnesium strontium oxide ($Ga_{0.88}La_{0.8}Mg_{0.12}Sr_{0.2}O_3$), oxygen-deficient
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 7440-02-0, Nickel, processes
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(foils, substrates; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 12177-86-5P, Calcium manganese oxide ($CaMnO_3$)
RL: PRP (Properties); SPN (Synthetic preparation); PREP (Preparation)
(perovskite-structured; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 65099-59-4, Calcium manganese oxide ($Ca_2Mn_3O_8$)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(phase; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 7790-86-5, Cerium chloride ($CeCl_3$) 10025-84-0, Lanthanum chloride ($LaCl_3$) heptahydrate 10025-94-2, Yttrium chloride (YCl_3) hexahydrate 10060-12-5, Chromium chloride ($CrCl_3$) hexahydrate 13446-34-9, Manganese chloride ($MnCl_2$) tetrahydrate 13450-84-5, Gadolinium chloride ($GdCl_3$) hexahydrate 13477-34-4, Calcium nitrate ($Ca(NO_3)_2$) tetrahydrate 13520-92-8, Zirconium chloride oxide ($ZrCl_2O$) octahydrate
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PROC (Process)
(starting material; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

IT 147703-98-8
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); PYP (Physical process); PROC (Process)
(substrate; electrodeposition of ceramics and ceramic composites for **fuel cell** applications)

L12 ANSWER 2 OF 40 CAPLUS

ACCESSION NUMBER: 2003:384503 CAPLUS
DOCUMENT NUMBER: 139:152232
TITLE: Novel SOFC anodes for the direct electrochemical oxidation of hydrocarbons
AUTHOR(S): Gorte, R. J.; Vohs, J. M.
CORPORATE SOURCE: Department of Chemical Engineering, University of Pennsylvania, Philadelphia, PA, 19104, USA
SOURCE: Journal of Catalysis (2003), 216(1-2), 477-486
CODEN: JCTLA5; ISSN: 0021-9517
PUBLISHER: Elsevier Science
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Recent developments in solid-oxide fuel cells (SOFC) that electrochem. oxidize hydrocarbon fuels to produce elec. power without first reforming them to H2 are described. First, the operating principles of SOFCs are reviewed, along with a description of state-of-the-art SOFC designs. This is followed by a discussion of the concepts and procedures used in the synthesis of direct-oxidn. fuel cells with anodes based on composites of Cu, ceria, and yttria-**stabilized zirconia**. The discussion focuses on how heterogeneous catalysis has an important role to play in the development of SOFCs that directly oxidize hydrocarbon fuels.

REFERENCE COUNT: 49 THERE ARE 49 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Recent developments in solid-oxide fuel cells (SOFC) that electrochem. oxidize hydrocarbon fuels to produce elec. power without first reforming them to H2 are described. First, the operating principles of SOFCs are reviewed, along with a description of state-of-the-art SOFC designs. This is followed by a discussion of the concepts and procedures used in the synthesis of direct-oxidn. fuel cells with anodes based on composites of Cu, ceria, and yttria-**stabilized zirconia**. The discussion focuses on how heterogeneous catalysis has an important role to play in the development of SOFCs that directly oxidize hydrocarbon fuels.

ST solid oxide **fuel cell** anode oxidn hydrocarbon; yttria **stabilized zirconia** copper **cermet** ceria **fuel cell** anode

IT Cermets
  Fuel cell anodes
 Oxidation, electrochemical
 Solid state fuel cells
  (anodes for direct electrochem. oxidn. of hydrocarbons in fuel cells)

IT **1306-38-3**, Cerium oxide, uses 7440-50-8, Copper, uses 12031-12-8, Lanthanum manganese oxide (LaMnO3) 64417-98-7, Yttrium zirconium oxide
 RL: DEV (Device component use); USES (Uses)
  (anodes for direct electrochem. oxidn. of hydrocarbons in fuel cells)

L12 ANSWER 3 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2002:836449 CAPLUS
DOCUMENT NUMBER: 138:173252
TITLE: Study on steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermets
AUTHOR(S): Takeguchi, Tatsuya; Kani, Yukimune; Yano, Tatsuya; Kikuchi, Ryuji; Eguchi, Koichi; Tsujimoto, Keigo; Uchida, Yoshitaka; Ueno, Akira; Omoshiki, Koiji; Aizawa, Masanobu
CORPORATE SOURCE: Department of Energy and Hydrocarbon Chemistry, Kyoto University, Graduate School of Engineering, Sakyo-ku, Kyoto, 606-8501, Japan
SOURCE: Journal of Power Sources (2002), 112(2), 588-595
CODEN: JPSODZ; ISSN: 0378-7753
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Equil. partial pressure of oxygen and the boundary of carbon deposition region were calcd. in the C-H-O phase diagram at 400-1000.degree.. The open circuit voltage for the solid oxide **fuel cell** (SOFC) was directly connected to the calcd. partial pressure of oxygen at higher temps. These calcns. suggested that the development of the anode catalyst without carbon deposition was one of the most promising ways to achieve high efficiency in SOFC because the amt. of added water could be reduced. The characteristics of steam reforming of methane and carbon deposition on Ni-Y2O3-**stabilized zirconia** (Ni-YSZ) cermets anodes were examd. The effect of MgO, CaO, SrO and CeO2 addn. to Ni-YSZ cermets on their catalytic activity and carbon deposition was studied. All cermets were calcined and then reduced with hydrogen prior to the reforming reaction. Although, the CaO addn. slightly deteriorated the electrochem. activity as anode, the CaO addn. was effective in suppressing carbon deposition and promoted steam reforming of CH4.

REFERENCE COUNT: 23 THERE ARE 23 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Equil. partial pressure of oxygen and the boundary of carbon deposition region were calcd. in the C-H-O phase diagram at 400-1000.degree.. The open circuit voltage for the solid oxide **fuel cell** (SOFC) was directly connected to the calcd. partial pressure of oxygen at higher temps. These calcns. suggested that the development of the anode

catalyst without carbon deposition was one of the most promising ways to achieve high efficiency in SOFC because the amt. of added water could be reduced. The characteristics of steam reforming of methane and carbon deposition on Ni-Y2O3-**stabilized zirconia** (Ni-YSZ) cermets anodes were examd. The effect of MgO, CaO, SrO and CeO2 addn. to Ni-YSZ cermets on their catalytic activity and carbon deposition was studied. All cermets were calcined and then reduced with hydrogen prior to the reforming reaction. Although, the CaO addn. slightly deteriorated the electrochem. activity as anode, the CaO addn. was effective in suppressing carbon deposition and promoted steam reforming of CH4.

ST steam reforming methane carbon deposition nickel YSZ anode **cermet** ; ethane ethene steam reforming solid oxide **fuel cell** catalyst

IT Electric current-potential relationship
Fuel cell anodes
Steam reforming catalysts
Water gas shift reaction
(steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermets modified with Ce2O or alk. earth oxides)

IT 1314-23-4, **Zirconia**, uses
RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(Y2O3-**stabilized** composite, **cermet** composite with Ni, optionally with Mg, Ca, Sr and Ce addn.; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermets modified with Ce2O or alk. earth oxides)

IT 7440-02-0, Nickel, uses
RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(composite with Y2O3- **stabilized zirconia** **cermet**, optionally with Mg, Ca, Sr and Ce addn.; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermets modified with Ce2O or alk. earth oxides)

IT 108916-21-8, Lanthanum strontium manganese oxide (La0.6Sr0.4MnO3)
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(**fuel cell** cathode; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermets modified with Ce2O or alk. earth oxides)

IT 1305-78-8, Calcium oxide (CaO), uses **1306-38-3**, Cerium oxide (CeO2), uses 1309-48-4, Magnesium oxide (MgO), uses 1314-11-0, Strontium oxide (SrO), uses
RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(precursor for **cermet** composite with Ni and Y2O3-**stabilized zirconia**; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermets modified with Ce2O or alk. earth oxides)

IT 1314-36-9, Yttrium oxide (Y2O3), uses
RL: CAT (Catalyst use); DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(**stabilized zirconia** composite, **cermet** composite with Ni, optionally with Mg, Ca, Sr and Ce addn.; steam reforming of CH4 and C2 hydrocarbons and carbon deposition on Ni-YSZ cermets modified with Ce2O or alk. earth oxides)

L12 ANSWER 4 OF 40 CAPLUS

ACCESSION NUMBER: 2002:662441 CAPLUS
DOCUMENT NUMBER: 138:173203
TITLE: An examination of lanthanide additives on the performance of Cu-YSZ **cermet** anodes
AUTHOR(S): McIntosh, Steven; Vohs, John M.; Gorte, Raymond J.
CORPORATE SOURCE: Department of Chemical Engineering, University of Pennsylvania, Philadelphia, PA, 19104, USA

SOURCE: Electrochimica Acta (2002), 47(22-23), 3815-3821
CODEN: ELCAAV; ISSN: 0013-4686
PUBLISHER: Elsevier Science Ltd.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB The effect of various lanthanide additives on the performance of Cu-yttria-**stabilized zirconia** (YSZ) **cermet** anodes for solid-oxide fuel cells (SOFCs) was studied at 973 K for H2 and the direct oxidn. of butane. In all cases, the lanthanide oxides were added to the SOFC by impregnation of a porous YSZ matrix with aq. solns. of the nitrate salts, followed by decompn. of nitrate ions by calcination. Ceria is significantly more effective in promoting SOFC performance compared with the other lanthanides, and the performance of the lanthanide additives followed the catalytic activity obsd. for butane oxidn. with 100 torr each of butane and O2. Samaria doping of ceria led to a slight decrease in performance but also decreased the catalytic activity of ceria for butane oxidn. Membrane-reactor studies with propylene fed to Cu-molybdena-YSZ anodes at 723 K showed a high selectivity to acrolein, while Cu-ceria-YSZ anodes showed only total oxidn. products under these conditions, implying that the catalytic properties of the oxides must be important. The application of these results to improved SOFC for direct oxidn. of hydrocarbons is discussed.
REFERENCE COUNT: 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI An examination of lanthanide additives on the performance of Cu-YSZ **cermet** anodes

AB The effect of various lanthanide additives on the performance of Cu-yttria-**stabilized zirconia** (YSZ) **cermet** anodes for solid-oxide fuel cells (SOFCs) was studied at 973 K for H2 and the direct oxidn. of butane. In all cases, the lanthanide oxides were added to the SOFC by impregnation of a porous YSZ matrix with aq. solns. of the nitrate salts, followed by decompn. of nitrate ions by calcination. Ceria is significantly more effective in promoting SOFC performance compared with the other lanthanides, and the performance of the lanthanide additives followed the catalytic activity obsd. for butane oxidn. with 100 torr each of butane and O2. Samaria doping of ceria led to a slight decrease in performance but also decreased the catalytic activity of ceria for butane oxidn. Membrane-reactor studies with propylene fed to Cu-molybdena-YSZ anodes at 723 K showed a high selectivity to acrolein, while Cu-ceria-YSZ anodes showed only total oxidn. products under these conditions, implying that the catalytic properties of the oxides must be important. The application of these results to improved SOFC for direct oxidn. of hydrocarbons is discussed.

ST solid oxide **fuel cell** copper yttria **stabilized zirconia** anode; copper lanthanide yttria **stabilized zirconia cermet** anode **fuel cell**

IT Cermets
Fuel cell anodes
(effect of lanthanide additives on performance of Cu-YSZ **cermet** anodes)

IT 497818-62-9 497818-68-5 497818-73-2 497818-79-8 **497818-80-1** 497818-82-3 497818-83-4 497818-86-7 497818-92-5 497818-93-6 497818-94-7
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(effect of lanthanide additives on performance of Cu-YSZ **cermet** anodes)

IT 1333-74-0, Hydrogen, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(effect of lanthanide additives on performance of Cu-YSZ **cermet** anodes)

IT 106-97-8, Butane, uses 115-07-1, Propylene, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(fuel; effect of lanthanide additives on performance of Cu-YSZ **cermet** anodes)

L12 ANSWER 5 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2002:555812 CAPLUS
DOCUMENT NUMBER: 137:127530
TITLE: Nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alcohol fuels
INVENTOR(S): Gorte, Raymond J.; Vohs, John M.
PATENT ASSIGNEE(S): Trustees of the University of Pennsylvania, USA
SOURCE: PCT Int. Appl., 57 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 2002058169	A2	20020725	WO 2001-US51149	20011109
WO 2002058169	A3	20030417		

W: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM

RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR, BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2003035989	A1	20030220	US 2001-53085	20011109
EP 1344271	A2	20030917	EP 2001-994519	20011109

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR

PRIORITY APPLN. INFO.:
US 2000-247444P P 20001109
US 2001-269525P P 20010219
US 2001-308313P P 20010727
US 2001-289462P P 20010508
WO 2001-US51149 W 20011109

AB A solid oxide **fuel cell**, with inherent sulfur resistance for direct combustion of sulfur-contg. fuels (e.g., at 1-5000 ppm S content), consists of a anion-conductive solid electrolyte, a ceramic-metal composite (**cermet**) direct-oxidn. anode, and a cathode. The ceramic-metal (preferably nickel-yttria-**stabilized zirconia** ceramic) anode is fabricated by prepg. a nickel **cermet** contg. 10-60 wt.% Ni, leaching a portion of the nickel to impart a porosity, impregnating the porous nickel-**cermet** with a copper salt that is later calcined to CuO and then reduced to elemental copper. The resulting copper **cermet** or copper-nickel alloy **cermet** can be used as the direct-oxidn. anode. The anode can be fabricated as a multilayered cast ceramic tape and incorporated into the **fuel cell**. Anodes can be reactivated following sulfur deactivation by treating the anode with steam. Suitable fuels for use with the **fuel cell** include gasoline, diesel fuel, naphtha, jet fuel (JP-4, JP-5, and JP-8), kerosine, natural gas, fuel oil, MeOH, EtOH, methane, butane, toluene, and decane.

TI Nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alcohol fuels

AB A solid oxide **fuel cell**, with inherent sulfur resistance for direct combustion of sulfur-contg. fuels (e.g., at 1-5000 ppm S content), consists of a anion-conductive solid electrolyte, a ceramic-metal composite (**cermet**) direct-oxidn. anode, and a cathode. The ceramic-metal (preferably nickel-yttria-**stabilized zirconia** ceramic) anode is fabricated by prepg. a nickel **cermet** contg. 10-60 wt.% Ni, leaching a portion of the nickel to

impart a porosity, impregnating the porous nickel-**cermet** with a copper salt that is later calcined to CuO and then reduced to elemental copper. The resulting copper **cermet** or copper-nickel alloy **cermet** can be used as the direct-oxidn. anode. The anode can be fabricated as a multilayered cast ceramic tape and incorporated into the **fuel cell**. Anodes can be reactivated following sulfur deactivation by treating the anode with steam. Suitable fuels for use with the **fuel cell** include gasoline, diesel fuel, naphtha, jet fuel (JP-4, JP-5, and JP-8), kerosine, natural gas, fuel oil, MeOH, EtOH, methane, butane, toluene, and decane.

ST sulfur resistant **fuel cell** nickel **cermet** anode; ceramic nickel anode sulfur resistant **fuel cell** ; tape casting ceramic nickel anode **fuel cell**

IT **Fuel cell** anodes
(cermets; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT Diesel fuel
Jet aircraft fuel
(fuel, sulfur-contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT Gasoline
Naphtha
Natural gas, miscellaneous
RL: MSC (Miscellaneous)
(fuel, sulfur-contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT Cermets
Fuel cell cathodes
(nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT **Fuel cell** electrolytes
(solid electrolytes; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT Fuel cells
(solid-oxide; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT Ceramics
Molding of ceramics
(tapes; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT Steam
(treatment with, in reactivation of sulfur-deactivated **fuel cell** anodes; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT 1345-13-7, Cerium oxide (Ce_2O_3) 7440-44-0, Carbon, uses
RL: DEV (Device component use); USES (Uses)
(**cermet** composite anodes contg.; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT 1313-99-1, Nickel oxide (NiO), uses
RL: DEV (Device component use); USES (Uses)
(**cermet** composites; nickel-ceramic composite (**cermet**) anode for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT 7440-19-9, Samarium, uses 7440-24-6, Strontium, uses 7440-54-2, Gadolinium, uses
RL: DEV (Device component use); USES (Uses)

(dopant, solid electrolyte contg.; nickel-ceramic composite (
cermet) anode for sulfur-resistant solid oxide fuel cells
combusting hydrocarbon and alc. fuels)

IT **1306-38-3**, Cerium dioxide, uses
RL: DEV (Device component use); USES (Uses)
(doped, solid electrolyte contg.; nickel-ceramic composite (
cermet) anode for sulfur-resistant solid oxide fuel cells
combusting hydrocarbon and alc. fuels)

IT **12442-45-4**, Cerium oxide sulfide (Ce2O2S)
RL: FMU (Formation, unclassified); RCT (Reactant); REM (Removal or
disposal); FORM (Formation, nonpreparative); PROC (Process); RACT
(Reactant or reagent)
(formation and removal of, from sulfur-deactivated anodes;
nickel-ceramic composite (**cermet**) anode for sulfur-resistant
solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT 64-17-5, Ethanol, miscellaneous 67-56-1, Methanol, miscellaneous
74-82-8, Methane, miscellaneous 106-97-8, n-Butane, miscellaneous
108-88-3, Toluene, miscellaneous 124-18-5, Decane
RL: MSC (Miscellaneous)
(fuel, sulfur-contg.; nickel-ceramic composite (**cermet**) anode
for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and
alc. fuels)

IT 7782-42-5, Graphite, uses
RL: NUU (Other use, unclassified); USES (Uses)
(pore forming agent; nickel-ceramic composite (**cermet**) anode
for sulfur-resistant solid oxide fuel cells combusting hydrocarbon and
alc. fuels)

IT 12160-53-1, Lanthanum gallium oxide (LaGaO3)
RL: DEV (Device component use); USES (Uses)
(solid electrolyte contg.; nickel-ceramic composite (**cermet**)
anode for sulfur-resistant solid oxide fuel cells combusting
hydrocarbon and alc. fuels)

IT 12031-12-8, Lanthanum manganese oxide (LaMnO3)
RL: DEV (Device component use); USES (Uses)
(strontium-doped, solid electrolyte contg.; nickel-ceramic composite (
cermet) anode for sulfur-resistant solid oxide fuel cells
combusting hydrocarbon and alc. fuels)

IT 1314-23-4, **Zirconia**, uses
RL: DEV (Device component use); USES (Uses)
(yttria-**stabilized**, **cermet** composites;
nickel-ceramic composite (**cermet**) anode for sulfur-resistant
solid oxide fuel cells combusting hydrocarbon and alc. fuels)

IT 1314-36-9, Yttrium oxide (Y2O3), uses
RL: DEV (Device component use); USES (Uses)
(**zirconia stabilized** with, **cermet**
composites; nickel-ceramic composite (**cermet**) anode for
sulfur-resistant solid oxide fuel cells combusting hydrocarbon and alc.
fuels)

L12 ANSWER 6 OF 40 CAPLUS
ACCESSION NUMBER: 2002:315391 CAPLUS
DOCUMENT NUMBER: 136:328203
TITLE: Solid oxide **fuel cell** having a supported electrolyte film
INVENTOR(S): Ukai, Kenji; Mizutani, Yasunobu
PATENT ASSIGNEE(S): Toho Gas Co. Ltd., Japan
SOURCE: U.S. Pat. Appl. Publ., 11 pp.
CODEN: USXXCO
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO. KIND DATE APPLICATION NO. DATE

US 2002048701	A1	20020425	US 2001-983056	20011023
JP 2002134131	A2	20020510	JP 2000-322671	20001023
EP 1202369	A1	20020502	EP 2001-125146	20011023

R: AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT, IE, SI, LT, LV, FI, RO, MK, CY, AL, TR

PRIORITY APPLN. INFO.: JP 2000-322671 A 20001023

AB The present invention intends to provide a solid oxide **fuel cell** having a supported electrolyte film, which shows sufficiently high reliability, yields a high output, and exhibits high output power d. per unit vol. The present invention is characterized by use of a first **cermet** comprising catalyst and a second solid electrolyte, which has a bending strength of more than 500 MPa and exhibits oxide ion cond., for a fuel electrode substrate in an SOFC having a supported electrolyte film equipped with an electrolyte-electrode assembly that is made by bonding the fuel electrode substrate and an air electrode on both sides of an electrolyte film consisting of the first solid electrolyte capable of exhibiting oxide ion cond. As a preferred embodiment, **stabilized zirconia** contg. 2 to 4 mol% yttria or 3 to 6 mol% scandia is preferred for the second solid electrolyte. More particularly, an interlayer comprising the second catalyst and the third solid electrolyte, which shows oxide ion cond. of more than 0.1 S/cm at 800.degree., is preferably interposed between the electrolyte film and the fuel electrode substrate.

TI Solid oxide **fuel cell** having a supported electrolyte film

AB The present invention intends to provide a solid oxide **fuel cell** having a supported electrolyte film, which shows sufficiently high reliability, yields a high output, and exhibits high output power d. per unit vol. The present invention is characterized by use of a first **cermet** comprising catalyst and a second solid electrolyte, which has a bending strength of more than 500 MPa and exhibits oxide ion cond., for a fuel electrode substrate in an SOFC having a supported electrolyte film equipped with an electrolyte-electrode assembly that is made by bonding the fuel electrode substrate and an air electrode on both sides of an electrolyte film consisting of the first solid electrolyte capable of exhibiting oxide ion cond. As a preferred embodiment, **stabilized zirconia** contg. 2 to 4 mol% yttria or 3 to 6 mol% scandia is preferred for the second solid electrolyte. More particularly, an interlayer comprising the second catalyst and the third solid electrolyte, which shows oxide ion cond. of more than 0.1 S/cm at 800.degree., is preferably interposed between the electrolyte film and the fuel electrode substrate.

ST **fuel cell** supported electrolyte film

IT Fuel cells
(power plants; solid oxide **fuel cell** having supported electrolyte film)

IT Automobiles
Cermets
Fuel cell electrolytes
Solid state fuel cells
(solid oxide **fuel cell** having supported electrolyte film)

IT 108916-22-9, Lanthanum manganese strontium oxide La0.8MnSr0.2O3 112721-99-0 113482-02-3, Tz-3y 114168-16-0, Tz-8y 157979-54-9, Scandium zirconium oxide Sc0.22Zr0.89O2.11 413584-20-0, Yttrium zirconium oxide (Y0.04-0.08Zr0.96-0.98O2.02-2.04) 413584-24-4, Scandium zirconium oxide (Sc0.18-0.24Zr0.88-0.91O2.09-2.12) 413584-27-7, Scandium zirconium oxide (Sc0.06-0.12Zr0.94-0.97O2.03-2.06)
RL: DEV (Device component use); USES (Uses)
(solid oxide **fuel cell** having supported electrolyte film)

IT **1344-28-1**, Alumina, uses
RL: MOA (Modifier or additive use); USES (Uses)

(solid oxide **fuel cell** having supported electrolyte
film)

L12 ANSWER 7 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 2001:841657 CAPLUS
DOCUMENT NUMBER: 136:186551
TITLE: Development of anodes for direct oxidation of hydrocarbon fuels
AUTHOR(S): Gorte, R. J.; Kim, H.; Vohs, J. M.
CORPORATE SOURCE: Dep. Chem. Eng., Univ. Pennsylvania, Philadelphia, PA, 19104, USA
SOURCE: Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry (2001), 46(2), 678-679
CODEN: PSADFZ; ISSN: 1521-4648
PUBLISHER: American Chemical Society, Division of Fuel Chemistry
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Direct electrochem. oxidn. of a wide variety of hydrocarbon fuels was evaluated in a direct-oxidn. solid oxide **fuel cell** with YSZ (yttria-**stabilized zirconia**) as the electrolyte and Cu-YSZ cermets as the **fuel cell** anode. Strontium-doped $LaMnO_3$ was used as the cell cathode. Addn. of a second metal oxide catalyst can enhance and modify the activities of the anode catalysts (e.g., for propylene oxidn., addn. of ceria promotes oxidn. to CO_2, whereas addn. of molybdena favored oxidn. to acrolein). Open-circuit voltages of 0.9-1.1 V were routinely obsd. for fuel cells combusting butane, decane, toluene, and synthetic diesel fuel, with good cell performance stability. Significant improvements in the performance can be expected when fuel cells are synthesized with thinner electrolytes, with improved anode structures, and with enhanced anode oxidn. activities.

REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Direct electrochem. oxidn. of a wide variety of hydrocarbon fuels was evaluated in a direct-oxidn. solid oxide **fuel cell** with YSZ (yttria-**stabilized zirconia**) as the electrolyte and Cu-YSZ cermets as the **fuel cell** anode. Strontium-doped $LaMnO_3$ was used as the cell cathode. Addn. of a second metal oxide catalyst can enhance and modify the activities of the anode catalysts (e.g., for propylene oxidn., addn. of ceria promotes oxidn. to CO_2, whereas addn. of molybdena favored oxidn. to acrolein). Open-circuit voltages of 0.9-1.1 V were routinely obsd. for fuel cells combusting butane, decane, toluene, and synthetic diesel fuel, with good cell performance stability. Significant improvements in the performance can be expected when fuel cells are synthesized with thinner electrolytes, with improved anode structures, and with enhanced anode oxidn. activities.

ST **fuel cell** cathode copper **cermet**; hydrocarbon combustion **fuel cell** cathode copper **cermet**; yttria **stabilized zirconia** copper **cermet** **fuel cell** anode

IT Cermets
Combustion catalysts
(copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT Diesel fuel
(oxidn. and combustion of, in fuel cells; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT **Fuel cell** anodes
(solid-oxide; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT **1306-38-3**, Cerium oxide (CeO_2), uses 1313-27-5, Molybdena, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(anodes contg.; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT 12031-12-8, Lanthanum manganese oxide (LaMnO3)
RL: DEV (Device component use); USES (Uses)
(cathodes; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT 64417-98-7, Yttrium zirconium oxide
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(composites, **cermet** anodes and solid electrolytes; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT 7440-50-8, Copper, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(composites, **cermet** anodes; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT 107-02-8, Acrolein, formation (nonpreparative)
RL: FMU (Formation, unclassified); FORM (Formation, nonpreparative)
(formation of, in **fuel cell** combustion; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT 106-97-8, Butane, reactions 108-88-3, Toluene, reactions 115-07-1, Propylene, reactions 124-18-5, n-Decane
RL: CPS (Chemical process); PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(oxidn. and combustion of, in fuel cells; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

IT 1314-23-4, **Zirconia**, uses
RL: CAT (Catalyst use); DEV (Device component use); USES (Uses)
(yttria-**stabilized**, composites; copper-YSZ cermets as **fuel cell** anodes for direct oxidn. of hydrocarbon fuels)

ACCESSION NUMBER: 2001:819790 CAPLUS
DOCUMENT NUMBER: 136:234579
TITLE: Noble metal alloy-Zr(Sc)O2 **cermet** cathode for reduced-temperature SOFCs
AUTHOR(S): Sasaki, K.; Tamura, J.; Dokiya, M.
CORPORATE SOURCE: Tanaka Kikinzoku Kogyo K.K., Kanagawa, Atsugi, 243-0213, Japan
SOURCE: Solid State Ionics (2001), 144(3,4), 233-240
CODEN: SSIOD3; ISSN: 0167-2738
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Polarization characteristics of noble metal alloy-(Sc0.10Ce0.01)Zr0.89O2 (SSZ) **cermet** cathodes were studied in order to develop a new cathode for reduced-temp. solid oxide fuel cells (SOFCs). Several noble metal alloy-SSZ **cermet** cathodes were prepd. by mixing Pt, Pd, Rh and/or Ag and their alloy powders with SSZ powder by using a high-energy ball mill in vacuum and pasting the **cermet** onto yttria **stabilized zirconia** (YSZ) electrolyte. A Pt-Ag/SSZ **cermet** cathode achieved as high as 12 S/cm2 of interfacial cond., .sigma.E, at 973 K and 1.5 S/cm2 at 873 K in air. This Pt-Ag/SSZ **cermet** cathode has enough activity not only at 973 K but also at 873 K, the high activity can be obtained by selecting a suitable alloy compn., ball milling a proper ratio of SSZ/noble metal mixt. in vacuum and controlling the cathode thickness and the sintering temp. By replacing the metallic component of **cermet** from Pt to Pt-Ag alloy (50 wt.% Pt), the quantity of Pt in **cermet** can be reduced to 19 from 40 mg/cm2 in addn. to the improvement of activity from 6.7 S/cm2 at 973 K to 12 S/cm2 of .sigma.E at 973 K. The activation energies, Ea, of Pt-Ag and Pd-Ag/SSZ **cermet** were smaller than that of Pt/SSZ **cermet**. In the case of Pt-Ag/SSZ **cermet**, the Ea decreased with

increasing Ag ratio in the Pt-Ag alloy. The Ea also depends on the SSZ/Pt-Ag ratio. This cathode showed two optima of .sigma.E vs. the SSZ/Pt-Ag ratio and a remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte and the second optimum originates from three-dimensional expansion of reaction sites into the **cermet** cathode layer.

REFERENCE COUNT: 24 THERE ARE 24 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Noble metal alloy-Zr(Sc)O2 **cermet** cathode for reduced-temperature SOFCs

AB Polarization characteristics of noble metal alloy-(Sc0.10Ce0.01)Zr0.89O2 (SSZ) **cermet** cathodes were studied in order to develop a new cathode for reduced-temp. solid oxide fuel cells (SOFCs). Several noble metal alloy-SSZ **cermet** cathodes were prepd. by mixing Pt, Pd, Rh and/or Ag and their alloy powders with SSZ powder by using a high-energy ball mill in vacuum and pasting the **cermet** onto yttria **stabilized zirconia** (YSZ) electrolyte. A Pt-Ag/SSZ **cermet** cathode achieved as high as 12 S/cm2 of interfacial cond., .sigma.E, at 973 K and 1.5 S/cm2 at 873 K in air. This Pt-Ag/SSZ **cermet** cathode has enough activity not only at 973 K but also at 873 K, the high activity can be obtained by selecting a suitable alloy compn., ball milling a proper ratio of SSZ/noble metal mixt. in vacuum and controlling the cathode thickness and the sintering temp. By replacing the metallic component of **cermet** from Pt to Pt-Ag alloy (50 wt.% Pt), the quantity of Pt in **cermet** can be reduced to 19 from 40 mg/cm2 in addn. to the improvement of activity from 6.7 S/cm2 at 973 K to 12 S/cm2 of .sigma.E at 973 K. The activation energies, Ea, of Pt-Ag and Pd-Ag/SSZ **cermet** were smaller than that of Pt/SSZ **cermet** . In the case of Pt-Ag/SSZ **cermet**, the Ea decreased with increasing Ag ratio in the Pt-Ag alloy. The Ea also depends on the SSZ/Pt-Ag ratio. This cathode showed two optima of .sigma.E vs. the SSZ/Pt-Ag ratio and a remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte and the second optimum originates from three-dimensional expansion of reaction sites into the **cermet** cathode layer.

ST **fuel cell** cathode oxide alloy **cermet**

IT **Fuel cell** cathodes
(noble metal alloy-Zr(Sc)O2 **cermet** cathode for reduced-temp. SOFCs)

IT Solid state fuel cells
(oxide; noble metal alloy-Zr(Sc)O2 **cermet** cathode for reduced-temp. SOFCs)

IT 12677-39-3 39309-13-2 54741-94-5 94949-98-1 101995-78-2 105682-73-3 156994-66-0 **403647-64-3**, Cerium scandium zirconium oxide (Ce0.01Sc0.1Zr0.89O2) 403647-65-4
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
(noble metal alloy-Zr(Sc)O2 **cermet** cathode for reduced-temp. SOFCs)

L12 ANSWER 9 OF 40 CAPLUS

ACCESSION NUMBER: 2001:819788 CAPLUS
DOCUMENT NUMBER: 136:234578
TITLE: Pt-**cermet** cathode for reduced temperature SOFCs
AUTHOR(S): Sasaki, K.; Tamura, J.; Dokiya, M.
CORPORATE SOURCE: Tanaka Kikinzoku Kogyo K.K., Atsugi, Kanagawa, 243-0213, Japan
SOURCE: Solid State Ionics (2001), 144(3,4), 223-232
CODEN: SSIOD3; ISSN: 0167-2738
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Polarization characteristics of Pt-(Sc0.10Ce0.01)Zr0.89O2 (SSZ)

cermet cathodes were studied in order to develop new cathodes for reduced temp. solid oxide fuel cells (SOFCs). Several Pt-SSZ **cermet** electrodes were prepd. by mixing Pt and SSZ powders by using a high-energy ball mill. A Pt-SSZ **cermet** cathode on yttria-**stabilized zirconia** (YSZ) electrolyte achieved high cathodic activity; the cathode interfacial cond. reached as high as 6.7 S/cm2 at 973 K and 0.8 S/cm2 at 873 K. These results suggest that this Pt-SSZ **cermet** cathode has enough capability at 973 K, but is still not satisfactory at 873 K. This high activity can be obtained by ball milling SSZ/Pt mixt. of proper ratios in vacuum and by controlling electrode thickness, sintering temp., and Ca impurity. These electrodes showed two optima of interfacial cond. vs. SSZ/Pt ratio and remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte surface and the second one originates from three-dimensional expansion of reaction sites into the **cermet** cathode.

REFERENCE COUNT: 21 THERE ARE 21 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Pt-**cermet** cathode for reduced temperature SOFCs

AB Polarization characteristics of Pt-(Sc0.10Ce0.01)Zr0.89O2 (SSZ) **cermet** cathodes were studied in order to develop new cathodes for reduced temp. solid oxide fuel cells (SOFCs). Several Pt-SSZ **cermet** electrodes were prepd. by mixing Pt and SSZ powders by using a high-energy ball mill. A Pt-SSZ **cermet** cathode on yttria-**stabilized zirconia** (YSZ) electrolyte achieved high cathodic activity; the cathode interfacial cond. reached as high as 6.7 S/cm2 at 973 K and 0.8 S/cm2 at 873 K. These results suggest that this Pt-SSZ **cermet** cathode has enough capability at 973 K, but is still not satisfactory at 873 K. This high activity can be obtained by ball milling SSZ/Pt mixt. of proper ratios in vacuum and by controlling electrode thickness, sintering temp., and Ca impurity. These electrodes showed two optima of interfacial cond. vs. SSZ/Pt ratio and remarkable dependence on cathode thickness. The first optimum is based on two-dimensional reaction sites on YSZ electrolyte surface and the second one originates from three-dimensional expansion of reaction sites into the **cermet** cathode.

ST **fuel cell** cathode platinum cerium scandium zirconium oxide

IT **Fuel cell** cathodes
  (Pt-**cermet** cathode for reduced temp. SOFCs)

IT Solid state fuel cells
  (oxide; Pt-**cermet** cathode for reduced temp. SOFCs)

IT 7440-06-4, Platinum, processes **403647-64-3**, Cerium scandium zirconium oxide (Ce0.01Sc0.1Zr0.89O2)
RL: PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process)
  (Pt-**cermet** cathode for reduced temp. SOFCs)

L12 ANSWER 10 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:101462 CAPLUS
DOCUMENT NUMBER: 134:134143
TITLE: Structures and fabrication techniques for solid state electrochemical devices
INVENTOR(S): Visco, Steven J.; Jacobson, Craig P.; Dejonghe, Lutgard C.
PATENT ASSIGNEE(S): The Regents of the University of California, USA
SOURCE: PCT Int. Appl., 45 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE

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WO 2001009968     A1   20010208       WO 2000-US20889  20000728
    W:  AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BZ, CA, CH, CN, CR,
        CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU,
        ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU,
        LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD,
        SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU,
        ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
    RW: GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW, AT, BE, CH, CY,
        DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ,
        CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG
US 6605316        B1   20030812       US 2000-626629   20000727
EP 1228546        A1   20020807       EP 2000-953766   20000728
    R:  AT, BE, CH, DE, DK, ES, FR, GB, GR, IT, LI, LU, NL, SE, MC, PT,
        IE, SI, LT, LV, FI, RO, MK, CY, AL
US 2003059668     A1   20030327       US 2002-273812   20021017
PRIORITY APPLN. INFO.:             US 1999-146769P  P  19990731
                                   US 2000-626629   A  20000727
                                   WO 2000-US20889  W  20000728
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AB Provided are low-cost, mech. strong, highly electronically conductive porous substrates and assocd. structures for solid-state electrochem. devices, techniques for forming these structures, and devices incorporating the structures. The invention provides solid state electrochem. device substrates of novel compn. and techniques for forming thin electrode/membrane/electrolyte coatings on the novel or more conventional substrates. In particular, in one embodiment the invention provides techniques for co-firing of device substrate (often an electrode) with an electrolyte or membrane layer to form densified electrolyte/membrane films 5 to 20 .mu.m thick. In another embodiment, densified electrolyte/membrane films 5 to 20 .mu.m thick may be formed on a pre-sintered substrate by a constrained sintering process. In some cases, the substrate may be a porous metal, alloy, or non-nickel **cermet** incorporating one or more of the transition metals Cr, Fe, Cu and Ag, or alloys thereof.

REFERENCE COUNT: 3 THERE ARE 3 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Provided are low-cost, mech. strong, highly electronically conductive porous substrates and assocd. structures for solid-state electrochem. devices, techniques for forming these structures, and devices incorporating the structures. The invention provides solid state electrochem. device substrates of novel compn. and techniques for forming thin electrode/membrane/electrolyte coatings on the novel or more conventional substrates. In particular, in one embodiment the invention provides techniques for co-firing of device substrate (often an electrode) with an electrolyte or membrane layer to form densified electrolyte/membrane films 5 to 20 .mu.m thick. In another embodiment, densified electrolyte/membrane films 5 to 20 .mu.m thick may be formed on a pre-sintered substrate by a constrained sintering process. In some cases, the substrate may be a porous metal, alloy, or non-nickel **cermet** incorporating one or more of the transition metals Cr, Fe, Cu and Ag, or alloys thereof.

ST electrochem device solid state; **fuel cell** solid state

IT **1344-28-1**, Alumina, uses 7439-89-6, Iron, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 7440-47-3, Chromium, uses 7440-50-8, Copper, uses 11078-74-3, Bismuth yttrium oxide (Bi3YO6) 12606-02-9, Inconel 600 59989-70-7D, Cobalt samarium strontium oxide CoSm0.5Sr0.5O3, oxygen-deficient 64417-98-7, Yttrium zirconium oxide 106830-29-9, Yttrium zirconium oxide Y0.2Zr0.9O2.1 108916-22-9D, Lanthanum manganese strontium oxide La0.8MnSr0.2O3, oxygen-deficient 111569-09-6, Scandium zirconium oxide 114168-16-0, Tz-8y 116036-94-3D, Iron lanthanum nickel oxide Fe0.4LaNi0.6O3, oxygen-deficient 141588-91-2D, Lanthanum manganese strontium oxide La0.45MnSr0.55O3, oxygen-deficient 157975-55-8D, Lanthanum manganese strontium oxide La0.65MnSr0.3O3, oxygen-deficient 181530-05-2D, Cobalt iron lanthanum

strontium oxide Co0.6Fe0.4La0.6Sr0.4O3, oxygen-deficient 197160-34-2, Cerium gadolinium oxide Ce0.8Gd0.4O2.2 235428-75-8D, Cerium manganese strontium oxide Ce0.3MnSr0.7O3, oxygen-deficient 252913-17-0, Gallium lanthanum magnesium strontium oxide Ga0.85La0.8Mg0.15Sr0.2O2.8 321909-12-0D, Lanthanum manganese strontium oxide (La0-0.95Mn0.95-1.15Sr0.05-1O3), oxygen-deficient 321909-14-2D, Cobalt lanthanum strontium oxide (CoLa0-0.9Sr0.1-1O3), oxygen-deficient 321909-15-3D, Cobalt iron strontium oxide (Co0.7-0.8Fe0.2-0.3SrO3), oxygen-deficient 321981-55-9, Cr5Fe1Y
RL: TEM (Technical or engineered material use); USES (Uses)
(substrate; structures and fabrication techniques for solid state electrochem. devices)

IT 1314-23-4, **Zirconia**, uses
RL: TEM (Technical or engineered material use); USES (Uses)
(yttria-**stabilized**, substrate; structures and fabrication techniques for solid state electrochem. devices)

IT 1314-36-9, Yttria, uses **12060-08-1**, Scandia
RL: TEM (Technical or engineered material use); USES (Uses)
(**zirconia stabilized** with, substrate; structures and fabrication techniques for solid state electrochem. devices)

L12 ANSWER 11 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2001:20011 CAPLUS
DOCUMENT NUMBER: 134:165589
TITLE: Zirconia-based SOFC with non-noble electrodes fed by air-methane mixture
AUTHOR(S): Demin, Anatoly K.; Gulbis, Fyodor Ya.
CORPORATE SOURCE: Ural Division RAS, Institute of High Temperature Electrochemistry, Yekaterinburg, 620219, Russia
SOURCE: Solid State Ionics (2000), 135(1-4), 451-456
CODEN: SSIOD3; ISSN: 0167-2738
PUBLISHER: Elsevier Science B.V.
DOCUMENT TYPE: Journal
LANGUAGE: English
AB One- and two-chamber solid oxide fuel cells (SOFCs) fed by an air-methane mixt. were studied at 550-700.degree.C. (Y2O3)0.04(Sc2O3)0.06(ZrO2)0.9 was used as a solid electrolyte, ceria-doped Ni-YSZ-**cermet** (CNC) and SrO-doped LaMnO3 (LSM) were used as electrodes. In the expts. with the two-chamber cell, it was stated that the LSM-electrode did not catalyze methane partial oxidn. and its potential was close to the potential of free oxygen mixed with methane and nitrogen. The CNC-electrode was a good catalyst for methane partial oxidn. and its potential was close to the potential of the mixt. formed in methane partial oxidn. process. In the one-chamber cell, the c.d. was about 15 mA/cm2 at the terminal voltage 500 mV within an interval of 550-650.degree.C.
REFERENCE COUNT: 4 THERE ARE 4 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT
AB One- and two-chamber solid oxide fuel cells (SOFCs) fed by an air-methane mixt. were studied at 550-700.degree.C. (Y2O3)0.04(Sc2O3)0.06(ZrO2)0.9 was used as a solid electrolyte, ceria-doped Ni-YSZ-**cermet** (CNC) and SrO-doped LaMnO3 (LSM) were used as electrodes. In the expts. with the two-chamber cell, it was stated that the LSM-electrode did not catalyze methane partial oxidn. and its potential was close to the potential of free oxygen mixed with methane and nitrogen. The CNC-electrode was a good catalyst for methane partial oxidn. and its potential was close to the potential of the mixt. formed in methane partial oxidn. process. In the one-chamber cell, the c.d. was about 15 mA/cm2 at the terminal voltage 500 mV within an interval of 550-650.degree.C.

ST solid oxide **fuel cell** electrode

IT **Fuel cell** anodes
Fuel cell electrodes
Fuel cell electrolytes

(zirconia-based solid oxide **fuel cell** with
non-noble electrodes fed by air-methane mixt.)

IT 1314-36-9, Yttria, uses
RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(in ceria-doped zirconia, nickel composite with; zirconia-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)

IT 74-82-8, Methane, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(reforming of, over ceria-doped nickel-yttria-**stabilized zirconia cermet**; **zirconia**-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)

IT **1306-38-3**, Ceria, uses
RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(yttria-**stabilized zirconia** doped with, nickel composite with; **zirconia**-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)

IT 1314-23-4, **Zirconia**, uses
RL: CAT (Catalyst use); DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(yttria-**stabilized**, ceria-doped, nickel composite with; **zirconia**-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)

IT 149026-96-0, Scandium yttrium zirconium oxide (Sc0.12Y0.08Zr0.9O2.1)
RL: DEV (Device component use); TEM (Technical or engineered material use); USES (Uses)
(zirconia-based solid oxide **fuel cell** with non-noble electrodes fed by air-methane mixt.)

L12 ANSWER 12 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2000:846849 CAPLUS
DOCUMENT NUMBER: 134:88679
TITLE: Internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**
AUTHOR(S): Tseng, Lin-Kuo; Huang, Ta-Jen
CORPORATE SOURCE: Department of Chemical Engineering, National Tsing Hua University, Hsinchu, 300, Taiwan
SOURCE: Journal of the Chinese Institute of Chemical Engineers (2000), 31(5), 493-498
CODEN: JCICAP; ISSN: 0368-1653
PUBLISHER: Chinese Institute of Chemical Engineers
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Methanol reforming was studied over a ceria-based electrode-catalyst in a solid oxide **fuel cell** under open- and close- circuit conditions. Different additive contents of Samaria-doped ceria (SDC), i.e., (CeO2)1-x(SmO1.5)x, were investigated to det. its possible application as an electrode-catalyst. Expts. were performed over a temp. range of 750.apprx.900.degree.C and under a steam/methanol molar ratio of 2. It may be concluded that the selectivity for methanol reforming is assocd. with the oxygen ionic cond. It was found that the Ni-SDC **cermet** exhibited a higher open-circuit potential than did that of Ni-YSZ (yttria-**stabilized zirconia**). Furthermore, (CeO2)0.9(SmO1.5)0.1 showed the highest depolarization ability in the SDC system because of the enhancement of elec. cond. and also had the highest selectivity for methanol reforming.

REFERENCE COUNT: 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**

AB Methanol reforming was studied over a ceria-based electrode-catalyst in a

solid oxide **fuel cell** under open- and close- circuit conditions. Different additive contents of Samaria-doped ceria (SDC), i.e., (CeO2)1-x(SmO1.5)x, were investigated to det. its possible application as an electrode-catalyst. Expts. were performed over a temp. range of 750.apprx.900.degree.C and under a steam/methanol molar ratio of 2. It may be concluded that the selectivity for methanol reforming is assocd. with the oxygen ionic cond. It was found that the Ni-SDC **cermet** exhibited a higher open-circuit potential than did that of Ni-YSZ (yttria-**stabilized zirconia**). Furthermore, (CeO2)0.9(SmO1.5)0.1 showed the highest depolarization ability in the SDC system because of the enhancement of elec. cond. and also had the highest selectivity for methanol reforming.

ST methanol reforming samaria ceria electrode **fuel cell**

IT Cermets
Electric current-potential relationship
Open circuit potential
Solid state fuel cells
Steam reforming catalysts
(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

IT **1306-38-3**, Cerium oxide (CeO2), uses 7440-02-0, Nickel, uses 12060-58-1, Samarium oxide (Sm2O3) 55575-06-9, Cerium samarium oxide 64417-98-7, Yttrium zirconium oxide 116875-84-4, Cerium samarium oxide (Ce0.8Sm0.2O1.9) 117655-29-5, Cerium samarium oxide (Ce0.9Sm0.1O1.95)
RL: CAT (Catalyst use); USES (Uses)
(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

IT 74-82-8P, Methane, preparation 124-38-9P, Carbon dioxide, preparation 630-08-0P, Carbon monoxide, preparation 1333-74-0P, Hydrogen, preparation
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

IT 67-56-1, Methanol, reactions
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(internal methanol reforming over samaria-doped ceria electrode in solid oxide **fuel cell**)

L12 ANSWER 13 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 2000:636152 CAPLUS
DOCUMENT NUMBER: 133:196306
TITLE: **Fuel cell** aluminum production
INVENTOR(S): Roha, David J.
PATENT ASSIGNEE(S): Aluminum Company of America, USA
SOURCE: U.S., 14 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 6117302	A	20000912	US 1998-136097	19980818

PRIORITY APPLN. INFO.: US 1998-136097 19980818

AB A process and app. are disclosed for electrolytically smelting alumina to produce aluminum metal, including providing a combination solid oxide **fuel cell** and electrolytic smelting cell for the prodn. of aluminum from refined alumina positioned near tile solid oxide **fuel cell**. In one aspect, an alumina ore refinery for producing the refined alumina is positioned near the solid oxide **fuel cell**, and refined alumina is passed at a temp. of

at least 900.degree. C. directly from the alumina ore refinery to the electrolytic smelting cell. In one aspect, the solid oxide **fuel cell** incorporates a planar construction having a solid state cathode material of lanthanum strontium manganate, a solid electrolyte of yttria **stabilized zirconia**, and a nickel/yttria **stabilized zirconia cermet** anode.

REFERENCE COUNT: 6 THERE ARE 6 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI **Fuel cell** aluminum production

AB A process and app. are disclosed for electrolytically smelting alumina to produce aluminum metal, including providing a combination solid oxide **fuel cell** and electrolytic smelting cell for the prodn. of aluminum from refined alumina positioned near tile solid oxide **fuel cell**. In one aspect, an alumina ore refinery for producing the refined alumina is positioned near the solid oxide **fuel cell**, and refined alumina is passed at a temp. of at least 900.degree. C. directly from the alumina ore refinery to the electrolytic smelting cell. In one aspect, the solid oxide **fuel cell** incorporates a planar construction having a solid state cathode material of lanthanum strontium manganate, a solid electrolyte of yttria **stabilized zirconia**, and a nickel/yttria **stabilized zirconia cermet** anode.

ST alumina electroredn aluminum prodn app solid oxide **fuel cell**

IT Heat transfer
(back and forth from electrolysis cell and solid oxide **fuel cell**)

IT Apparatus
(for aluminum prodn. comprising solid **fuel cell** and electrolytic smelting cell)

IT Current efficiency
(for aluminum prodn. from smelted alumina in solid state **fuel cell**)

IT Reduction, electrochemical
(of alumina to metal aluminum in app. comprising solid **fuel cell** and electrolytic smelting cell)

IT Fuel cells
(solid oxide **fuel cell** aluminum prodn.)

IT 7429-90-5P, Aluminum, preparation
RL: IMF (Industrial manufacture); PEP (Physical, engineering or chemical process); PREP (Preparation); PROC (Process)
(**fuel cell** aluminum prodn.)

IT **1344-28-1**, Alumina, processes
RL: PEP (Physical, engineering or chemical process); RCT (Reactant); PROC (Process); RACT (Reactant or reagent)
(**fuel cell** aluminum prodn. from smelted alumina)

IT 59707-46-9, Lanthanum strontium manganate
RL: DEV (Device component use); USES (Uses)
(use as cathode in solid oxide **fuel cell** aluminum prodn.)

IT 7440-02-0, Nickel, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(use in **cermet** anode in solid state **fuel cell** for aluminum prodn. from smelted alumina)

IT 1314-23-4, **Zirconia**, processes
RL: NUU (Other use, unclassified); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(yttria **stabilized**; use as electrolyte in solid state **fuel cell** for aluminum prodn. from smelted alumina)

L12 ANSWER 14 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 2000:208958 CAPLUS
DOCUMENT NUMBER: 132:224767

TITLE: Partial oxidation of methane to synthesis gas using Ni/Ca0.8Sr0.2TiO3 anode catalyst

AUTHOR(S): Hamakawa, Satoshi; Shiozaki, Ryuji; Hayakawa, Takashi; Suzuki, Kunio; Murata, Kazuhisa; Takehira, Katsuomi; Koizumi, Masaki; Nakamura, Junji; Uchijima, Toshio

CORPORATE SOURCE: National Institute of Materials and Chemical Research, Ibaraki, 305-8565, Japan

SOURCE: Journal of the Electrochemical Society (2000), 147(3), 839-844

CODEN: JESOAN; ISSN: 0013-4651

PUBLISHER: Electrochemical Society

DOCUMENT TYPE: Journal

LANGUAGE: English

AB A high performance electrochem. reactor for the partial oxidn. of CH4 into synthesis gas has been developed by fixing powder catalysts on the anode surface for the natural gas conversion. A powd. catalyst of Ni1.0/Ca0.8Sr0.2TiO3 fixed by a gold paste has excellent catalytic activity without significant deactivation by the carbon deposition. The conversion of CH4 at 1173 K is 38.8% with the selectivity to CO of 98.9%. The advantage of this system is the sepn. of N2 and O2 in the cathode chamber when using air as the oxidant gas instead of pure oxygen. Furthermore, an elec. power d. of 14.5 mW cm-2 has been obtained by this system at 1173 K. The amt. of carbon deposition over the Ni1.0/Ca0.8Sr0.2TiO3 is ten times lower than that over the Ni-yttria-**stabilized zirconia cermet** of a typical anode material in the solid oxide **fuel cell** system or the typical Ni/Al2O3 catalyst for CH4 conversion. This is attributed to the oxidn. of carbon deposits by the lattice oxygen species that migrated from the oxide to the Ni-Ca0.8Sr0.2TiO3 boundary. The synthesis gas is considered to be formed not only by the steam reforming of CH4 including the complete oxidn. but also by the direct oxidn. of CH4.

REFERENCE COUNT: 30 THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB A high performance electrochem. reactor for the partial oxidn. of CH4 into synthesis gas has been developed by fixing powder catalysts on the anode surface for the natural gas conversion. A powd. catalyst of Ni1.0/Ca0.8Sr0.2TiO3 fixed by a gold paste has excellent catalytic activity without significant deactivation by the carbon deposition. The conversion of CH4 at 1173 K is 38.8% with the selectivity to CO of 98.9%. The advantage of this system is the sepn. of N2 and O2 in the cathode chamber when using air as the oxidant gas instead of pure oxygen. Furthermore, an elec. power d. of 14.5 mW cm-2 has been obtained by this system at 1173 K. The amt. of carbon deposition over the Ni1.0/Ca0.8Sr0.2TiO3 is ten times lower than that over the Ni-yttria-**stabilized zirconia cermet** of a typical anode material in the solid oxide **fuel cell** system or the typical Ni/Al2O3 catalyst for CH4 conversion. This is attributed to the oxidn. of carbon deposits by the lattice oxygen species that migrated from the oxide to the Ni-Ca0.8Sr0.2TiO3 boundary. The synthesis gas is considered to be formed not only by the steam reforming of CH4 including the complete oxidn. but also by the direct oxidn. of CH4.

ST electrochem reactor partial oxidn methane synthesis gas; **fuel cell** partial oxidn methane synthesis gas

IT **1344-28-1**, Alumina, uses 7440-02-0, Nickel, uses 12047-27-7, Barium titanium oxide batio3, uses 12049-50-2, Calcium titanium oxide catio3 12060-59-2, Strontium titanium oxide srtio3 112721-99-0 118558-32-0, Calcium strontium titanium oxide Ca0.8Sr0.2TiO3
RL: CAT (Catalyst use); USES (Uses)
(partial oxidn. of methane to synthesis gas using Ni/Ca0.8Sr0.2TiO3 anode catalyst)

L12 ANSWER 15 OF 40 CAPLUS

ACCESSION NUMBER: 2000:185653 CAPLUS

DOCUMENT NUMBER: 132:224755

TITLE: Electrode materials for intermediate temperature proton-conducting fuel cells

AUTHOR(S): Tao, S. W.; Wu, Q. Y.; Peng, D. K.; Meng, G. Y.
CORPORATE SOURCE: Department of Materials Science and Engineering, University of Science and Technology of China, Hefei, 230026, Peop. Rep. China

SOURCE: Journal of Applied Electrochemistry (2000), 30(2), 153-157
CODEN: JAELBJ; ISSN: 0021-891X
PUBLISHER: Kluwer Academic Publishers
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Some electrode materials for intermediate temp. proton-conducting fuel cells are analyzed from the perspective of surface reaction and ionic cond. type. The performance of H2/O2 fuel cells using these materials as electrodes with LiNaSO4-Al2O3 as the electrolyte indicates that Ni-Al alloy, Ni-Al2O3 catalyst and Ni-YSZ **cermet** are potential candidates for anode materials and that LiNiO2, LiCoO2, Ag-SnO2 and La0.8Sr0.2MnO3 are good candidates for cathode materials. Among the tested electrode materials, for the same electrolyte, the LiNiO2/Ni-Al2O3 electrode pair gives the best cell performance.

REFERENCE COUNT: 17 THERE ARE 17 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Some electrode materials for intermediate temp. proton-conducting fuel cells are analyzed from the perspective of surface reaction and ionic cond. type. The performance of H2/O2 fuel cells using these materials as electrodes with LiNaSO4-Al2O3 as the electrolyte indicates that Ni-Al alloy, Ni-Al2O3 catalyst and Ni-YSZ **cermet** are potential candidates for anode materials and that LiNiO2, LiCoO2, Ag-SnO2 and La0.8Sr0.2MnO3 are good candidates for cathode materials. Among the tested electrode materials, for the same electrolyte, the LiNiO2/Ni-Al2O3 electrode pair gives the best cell performance.

ST **fuel cell** electrode material

IT **Fuel cell** electrodes
Fuel cells
(electrode materials for intermediate temp. proton-conducting fuel cells)

IT **1344-28-1**, Alumina, uses 7440-02-0, Nickel, uses 7440-22-4, Silver, uses 11114-68-4 12031-65-1, Lithium nickel oxide linio2 12057-17-9, Lithium manganese oxide limn2o4 12190-79-3, Cobalt lithium oxide colio2 13568-34-8, Lithium sodium sulfate 18282-10-5, Tin dioxide 64417-98-7, Yttrium zirconium oxide 108916-22-9, Lanthanum manganese strontium oxide La0.8MnSr0.2O3 112721-99-0
RL: DEV (Device component use); USES (Uses)
(electrode materials for intermediate temp. proton-conducting fuel cells)

IT 1314-23-4, **Zirconia**, uses
RL: DEV (Device component use); USES (Uses)
(yttria-**stabilized**; electrode materials for intermediate temp. proton-conducting fuel cells)

IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); USES (Uses)
(**zirconia stabilized** with; electrode materials for intermediate temp. proton-conducting fuel cells)

L12 ANSWER 16 OF 40 CAPLUS

ACCESSION NUMBER: 1999:723542 CAPLUS
DOCUMENT NUMBER: 131:325021

TITLE: Optimization of anodes of the high-temperature **fuel cell** by correlation of manufacture processes, microstructure, and properties

AUTHOR(S): Simwonis, Dimitrios
CORPORATE SOURCE: Inst. Werkstoffe Verfahren Energietechnik, Forschungszentrum Julich G.m.b.H., Julich, D-52425,

Germany
SOURCE: Berichte des Forschungszentrums Juelich (1999), Juel-3678, 1-124 pp.
CODEN: FJBEE5; ISSN: 0366-0885
DOCUMENT TYPE: Report
LANGUAGE: German

AB Solid oxide fuel cells (SOFCs) are electrochem. devices which directly convert the chem. energy of a fuel into electricity. At the Research Center Julich, the planar substrate concept was developed, in which the anode, which is a **cermet** of nickel and yttria-**stabilized zirconia**, consists of a supporting anode substrate, an a thin finely structured coating. The anode substrate currently used has been studied in detail using various methods of characterization, and its properties and microstructural features were detd. for further optimization expts. Various low-cost starting materials and different processing techniques were used for substrate prodn. These substrates were evaluated on the basis of their properties and microstructure with a view to application in solid oxide fuel cells. A series of microstructural tests have been carried out on anode substrates and anode layers with respect to their long-term stability. Aging of the anodes due to Ni agglomeration was described quant. and in terms of a model. Low Ni agglomeration was obsd. whenever both Ni as well as YSZ and pores were as finely distributed as possible.

REFERENCE COUNT: 123 THERE ARE 123 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Optimization of anodes of the high-temperature **fuel cell** by correlation of manufacture processes, microstructure, and properties

AB Solid oxide fuel cells (SOFCs) are electrochem. devices which directly convert the chem. energy of a fuel into electricity. At the Research Center Julich, the planar substrate concept was developed, in which the anode, which is a **cermet** of nickel and yttria-**stabilized zirconia**, consists of a supporting anode substrate, an a thin finely structured coating. The anode substrate currently used has been studied in detail using various methods of characterization, and its properties and microstructural features were detd. for further optimization expts. Various low-cost starting materials and different processing techniques were used for substrate prodn. These substrates were evaluated on the basis of their properties and microstructure with a view to application in solid oxide fuel cells. A series of microstructural tests have been carried out on anode substrates and anode layers with respect to their long-term stability. Aging of the anodes due to Ni agglomeration was described quant. and in terms of a model. Low Ni agglomeration was obsd. whenever both Ni as well as YSZ and pores were as finely distributed as possible.

ST **fuel cell** anode porous **cermet** substrate

IT Cermets
  Fuel cell anodes
  Solid state fuel cells
    (YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT Permeability
    (gas; of YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT Agglomeration
  Aging, materials
  Bending strength
  Electric conductivity
  Microstructure
  Oxidation kinetics
  Pore size distribution
  Pore structure
  Porosity
  Stability

Thermal expansion
(of YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT **1344-28-1**, Aluminum oxide (Al_2O_3), uses 12004-35-2, Aluminum nickel oxide (Al_2NiO_4)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(Al_2O_3-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT 12035-39-1, Nickel titanium oxide ($NiTiO_3$)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(TiO_2-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT 1313-99-1, Nickel oxide (NiO), uses 112721-99-0 114168-16-0, Yttrium zirconium oxide ($Y_{0.16}Zr_{0.92}O_{2.08}$)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT 13463-67-7, Titania, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(of YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT 1314-23-4, **Zirconia**, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(yttria-**stabilized**; YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(**zirconia stabilized** with; YSZ-Ni porous **cermet** substrate anodes for solid oxide fuel cells)

L12 ANSWER 17 OF 40 CAPLUS

ACCESSION NUMBER: 1999:723304 CAPLUS
DOCUMENT NUMBER: 131:312500
TITLE: Solid oxide **fuel cell** with sintered anode of metallic particles and oxides
INVENTOR(S): Van Berkel, Franciscus Petrus Felix; Schipper, Gerardus Simon; De Jong, Jan Peter
PATENT ASSIGNEE(S): Stichting Energieonderzoek Centrum Nederland, Neth.
SOURCE: PCT Int. Appl., 15 pp.
CODEN: PIXXD2
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
WO 9957779	A1	19991111	WO 1999-NL269	19990504

W: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, AM, AZ, BY, KG, KZ, MD, RU, TJ, TM
RW: GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW, AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
NL 1009060	C2	19991105	NL 1998-1009060	19980504

CA 2330661	AA	19991111	CA 1999-2330661	19990504
AU 9938526	A1	19991123	AU 1999-38526	19990504
AU 748484	B2	20020606		
EP 1080510	A1	20010307	EP 1999-921279	19990504
EP 1080510	B1	20030709		
R: CH, DE, DK, ES, FR, GB, IT, LI, NL				
JP 2002513997	T2	20020514	JP 2000-547670	19990504
US 6482539	B1	20021119	US 2000-674774	20001106

PRIORITY APPLN. INFO.: NL 1998-1009060 A 19980504
WO 1999-NL269 W 19990504

AB Anode for an electrochem. cell consists of a mixt. of electron- and ion-conducting particles. The ion-conducting particles consist of oxides. The anode is made up in such a way that that part of anode located close to the electrolyte comprises small oxygen-ion-conducting particles, while the part located closer to the current collector comprises coarser oxide particles. By this means it is possible to provide for optimum adaptation to the various requirements which are imposed in respect of the behavior of the anode located at the electrolyte or at the current collector.

REFERENCE COUNT: 8 THERE ARE 8 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

TI Solid oxide **fuel cell** with sintered anode of metallic particles and oxides

ST **fuel cell** anode metallic particle oxide

IT Rare earth compounds
RL: DEV (Device component use); USES (Uses)
(cerates; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Alkaline earth metals
Rare earth metals, uses
RL: MOA (Modifier or additive use); USES (Uses)
(fluorites doped with; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Group IIIA element compounds
RL: DEV (Device component use); USES (Uses)
(gallates; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Zirconates
RL: DEV (Device component use); USES (Uses)
(ion-conducting; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT **Fuel cell** anodes
Solid state fuel cells
(solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT Noble metals
RL: DEV (Device component use); USES (Uses)
(solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT **1344-28-1**, Alumina, uses
RL: DEV (Device component use); USES (Uses)
(**cermet**; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT **1306-38-3**, Ceria, uses 1314-23-4, Zirconia, uses 12055-23-1, Hafnia
RL: DEV (Device component use); USES (Uses)
(rare earth or alk. earth metal-doped; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT 7440-02-0, Nickel, uses 7440-50-8, Copper, uses 64417-98-7, Yttrium zirconium oxide 152233-89-1, Cerium gadolinium oxide ce0.9gd0.1o1.95
RL: DEV (Device component use); USES (Uses)
(solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); USES (Uses)

(**zirconia stabilized** with; solid oxide **fuel cell** with sintered anode of metallic particles and oxides)

L12 ANSWER 18 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1999:355925 CAPLUS
DOCUMENT NUMBER: 130:354697
TITLE: Testing tubular solid oxide fuel cells in nonsteady-state conditions
AUTHOR(S): Kharton, V. V.; Naumovich, E. N.; Tikhonovich, V. N.; Bashmakov, I. A.; Boginsky, L. S.; Kovalevsky, A. V.
CORPORATE SOURCE: Institute of Physicochemical Problems, Belarus State University, Minsk, 220080, Belarus
SOURCE: Journal of Power Sources (1999), 79(2), 242-249
CODEN: JPSODZ; ISSN: 0378-7753
PUBLISHER: Elsevier Science S.A.
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Fabrication of tubular-type solid oxide fuel cells (SOFCs) with yttria-**stabilized zirconia** electrolyte, cathodes and current collectors of lanthanum strontium manganite (LSM) is described. Particular emphasis is given to the techniques of producing LSM tubes by the isostatic pressing method, prepg. oxide electrodes via cellulose precursor decompn., and activation of SOFC electrodes by applying dispersed catalysts onto their surface. Coating nickel **cermet** anodes with dispersed ceria and depositing praseodymium oxide onto manganite cathode surface was found to result in improving SOFC performance. Testing single cells with externally switched pulse load demonstrated a possibility to optimize the SOFC operating mode at a given resistance of the closing circuit by variation of the pulse period-to-pulse duration ratio of the pulses which open the circuit. No effect of the pulse load frequency on SOFC performance was obsd. in the frequency range from 2 Hz to 50 kHz. The results of testing SOFCs in nonsteady-state conditions suggest applicability of the externally switched pulse load to match resistances of single cells in the SOFC stacks.

REFERENCE COUNT: 28 THERE ARE 28 CITED REFERENCES AVAILABLE FOR THIS RECORD. ALL CITATIONS AVAILABLE IN THE RE FORMAT

AB Fabrication of tubular-type solid oxide fuel cells (SOFCs) with yttria-**stabilized zirconia** electrolyte, cathodes and current collectors of lanthanum strontium manganite (LSM) is described. Particular emphasis is given to the techniques of producing LSM tubes by the isostatic pressing method, prepg. oxide electrodes via cellulose precursor decompn., and activation of SOFC electrodes by applying dispersed catalysts onto their surface. Coating nickel **cermet** anodes with dispersed ceria and depositing praseodymium oxide onto manganite cathode surface was found to result in improving SOFC performance. Testing single cells with externally switched pulse load demonstrated a possibility to optimize the SOFC operating mode at a given resistance of the closing circuit by variation of the pulse period-to-pulse duration ratio of the pulses which open the circuit. No effect of the pulse load frequency on SOFC performance was obsd. in the frequency range from 2 Hz to 50 kHz. The results of testing SOFCs in nonsteady-state conditions suggest applicability of the externally switched pulse load to match resistances of single cells in the SOFC stacks.

ST solid oxide **fuel cell** tubular testing

IT **1306-38-3**, Ceria, uses
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(anode coated with; fabrication and testing of tubular solid oxide fuel cells in nonsteady-state conditions)

IT 1314-23-4, **Zirconia**, uses
RL: DEV (Device component use); USES (Uses)
(yttria-**stabilized**, electrolyte; fabrication and testing of

tubular solid oxide fuel cells in nonsteady-state conditions)

IT 1314-36-9, Yttria, uses
RL: DEV (Device component use); USES (Uses)
(**zirconia stabilized** with, electrolyte; fabrication and testing of tubular solid oxide fuel cells in nonsteady-state conditions)

L12 ANSWER 19 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1998:31270 CAPLUS
DOCUMENT NUMBER: 128:117317
TITLE: Manufacture of anodes for solid electrolyte fuel cells
INVENTOR(S): Hishinuma, Yuichi; Matsusaki, Yoshio
PATENT ASSIGNEE(S): Tokyo Gas Co., Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 10003930	A2	19980106	JP 1996-340870	19961220
WO 9828808	A1	19980702	WO 1997-JP2656	19970730
W: CA, US				
RW: AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE				
EP 955685	A1	19991110	EP 1997-933855	19970730
R: CH, DE, GB, LI				

PRIORITY APPLN. INFO.:		
	JP 1996-98155	19960419
	JP 1996-340870	19961220
	WO 1997-JP2656	19970730

AB The stabilized yttria-Ni **cermet** anodes, for **fuel cell** stacks contg. alternate unit cells and separators, are prepd. by adding solns. of org. compds. of Y and transition metals to a soln. of an org. Zr compd., mixing the soln. mixt. with powd. NiO to form a slurry, hydrolyzing the slurry, condensation polymg. the hydrolyzate, thermally decompg. the polymer, and annealing. The NiO powder may be mixed with powd. solid solns. of CeO and oxides of di- and tri-valent metals. The transition metal is preferably Ce, Ti, or Pr and the di- and trivalent metal oxides are selected from BeO, MgO, CaO, SrO, BaO, Sm2O3, Y2O3, La2O3, Gd2O3, Sc2O3, Pr2O3, Nd2O3, Eu2O3, Yb2O3, Dy2O3, and Ho2O3.

AB The stabilized yttria-Ni **cermet** anodes, for **fuel cell** stacks contg. alternate unit cells and separators, are prepd. by adding solns. of org. compds. of Y and transition metals to a soln. of an org. Zr compd., mixing the soln. mixt. with powd. NiO to form a slurry, hydrolyzing the slurry, condensation polymg. the hydrolyzate, thermally decompg. the polymer, and annealing. The NiO powder may be mixed with powd. solid solns. of CeO and oxides of di- and tri-valent metals. The transition metal is preferably Ce, Ti, or Pr and the di- and trivalent metal oxides are selected from BeO, MgO, CaO, SrO, BaO, Sm2O3, Y2O3, La2O3, Gd2O3, Sc2O3, Pr2O3, Nd2O3, Eu2O3, Yb2O3, Dy2O3, and Ho2O3.

ST solid electrolyte **fuel cell cermet** anode; **fuel cell cermet** anode manuf; nickel YSZ anode manuf **fuel cell**

IT **Fuel cell** anodes
(compns. and manuf. of nickel-yttria **stabilized zirconia cermet** anodes for solid electrolyte fuel cells)

IT 1304-28-5, Barium oxide, uses 1304-56-9, Beryllium oxide, uses 1305-78-8, Calcia, uses 1308-87-8, Dysprosium oxide (Dy2O3) 1308-96-9, Europium oxide (Eu2O3) 1309-48-4, Magnesia, uses 1312-81-8, Lanthanum oxide (La2O3) 1313-97-9, Neodymium oxide (Nd2O3) 1314-11-0, Strontium oxide, uses 1314-37-0, Ytterbium oxide (Yb2O3) 12036-32-7, Praseodymium oxide (Pr2O3) **12060-08-1**, Scandium oxide (Sc2O3)

12064-62-9, Gadolinium oxide (Gd2O3) 116875-84-4, Cerium samarium oxide (Ce0.8Sm0.2O1.9) 143334-25-2, Cerium yttrium zirconium oxide 201490-56-4, Cerium samarium oxide 9, cerium yttrium zirconium oxide 10, nickel 81
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(compns. and manuf. of nickel-yttria **stabilized zirconia cermet** anodes for solid electrolyte fuel cells)

IT 1313-99-1, Nickel oxide (NiO), uses
RL: NUU (Other use, unclassified); USES (Uses)
(in manuf. of nickel-yttria **stabilized zirconia cermet** anodes for solid electrolyte fuel cells)

L12 ANSWER 20 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1997:346419 CAPLUS
DOCUMENT NUMBER: 127:20800
TITLE: Ceramic materials containing rare earth oxides for solid oxide **fuel cell**
AUTHOR(S): Eguchi, Koichi
CORPORATE SOURCE: Department of Materials Science and Technology, Graduate School of Engineering Sciences, Kyushu University, Kasugakoen, Kasuga, Fukuoka, Japan
SOURCE: Journal of Alloys and Compounds (1997), 250(1-2), 486-491
CODEN: JALCEU; ISSN: 0925-8388
PUBLISHER: Elsevier
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Materials for a solid oxide **fuel cell** were investigated aiming esp. at low temp. operation of the cell. Although yttria-**stabilized zirconia** has been most popularly investigated as an electrolyte for the cell, the cond. reaches the allowable level only around or higher than 1000.degree.C. The use of a ceria-based electrolyte, esp. samaria doped ceria, significantly lowered the operation temp. of the cell due to its high oxide ion cond. The redn. of ceria with H2 and resultant electronic conduction could be avoided by the coating of YSZ on to the anode side of the ceria. The ceria layer facing the air electrode is effective in reducing cathodic polarization. Ni-ceria **cermet** exhibited higher fuel electrode performance than Ni-YSZ **cermet** in lowering polarization.

TI Ceramic materials containing rare earth oxides for solid oxide **fuel cell**

AB Materials for a solid oxide **fuel cell** were investigated aiming esp. at low temp. operation of the cell. Although yttria-**stabilized zirconia** has been most popularly investigated as an electrolyte for the cell, the cond. reaches the allowable level only around or higher than 1000.degree.C. The use of a ceria-based electrolyte, esp. samaria doped ceria, significantly lowered the operation temp. of the cell due to its high oxide ion cond. The redn. of ceria with H2 and resultant electronic conduction could be avoided by the coating of YSZ on to the anode side of the ceria. The ceria layer facing the air electrode is effective in reducing cathodic polarization. Ni-ceria **cermet** exhibited higher fuel electrode performance than Ni-YSZ **cermet** in lowering polarization.

ST rare earth oxide **fuel cell**; electrolyte anode solid oxide **fuel cell**; ceria samaria doped electrolyte **fuel cell**; nickel yttria zirconia **cermet** anode

IT Electric conductivity
Fuel cell anodes
Fuel cell electrolytes
(ceramic materials contg. rare earth oxides for solid oxide **fuel cell**)

IT **1306-38-3**, Ceria, uses 7440-02-0, Nickel, uses 55575-06-9,

Cerium samarium oxide 64417-98-7, Yttrium zirconium oxide 114168-16-0, Yttrium zirconium oxide (Y0.16Zr0.92O2.08) 116845-73-9, Calcium cerium oxide (Ca0.2Ce0.8O1.8) 116875-84-4, Cerium samarium oxide (Ce0.8Sm0.2O1.9) 117655-31-9, Cerium lanthanum oxide (Ce0.8La0.2O1.9) 117655-32-0, Cerium gadolinium oxide (Ce0.8Gd0.2O1.9) 117655-33-1, Cerium thulium oxide (Ce0.8Tm0.2O1.9) 117655-34-2, Cerium ytterbium oxide (Ce0.8Yb0.2O1.9) 117655-35-3, Cerium erbium oxide (Ce0.8Er0.2O1.9) 117655-36-4, Cerium neodymium oxide (Ce0.8Nd0.2O1.9) 117655-37-5, Cerium holmium oxide (Ce0.8Ho0.2O1.9) 117655-38-6, Cerium dysprosium oxide (Ce0.8Dy0.2O1.9)
RL: DEV (Device component use); USES (Uses)
(ceramic materials contg. rare earth oxides for solid oxide **fuel cell**)

IT 1314-23-4, Zirconium oxide (ZrO2), uses
RL: DEV (Device component use); USES (Uses)
(yttria stabilized with; ceramic materials contg. rare earth oxides for solid oxide **fuel cell**)

IT 1314-36-9, Yttrium oxide (Y2O3), uses
RL: DEV (Device component use); USES (Uses)
(zirconia contg.; ceramic materials contg. rare earth oxides for solid oxide **fuel cell**)

L12 ANSWER 21 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1997:324494 CAPLUS
DOCUMENT NUMBER: 127:38345
TITLE: Polarization behavior of high temperature solid oxide electrolysis cells (SOEC)
AUTHOR(S): Momma, Akihiko; Kato, Tohru; Kaga, Yasuo; Nagata, Susumu
CORPORATE SOURCE: Energy Materials Section, Energy Fundamentals Division, Electrotechnical Laboratory, Ibaraki, 305, Japan
SOURCE: Journal of the Ceramic Society of Japan (1997), 105(May), 369-373
CODEN: JCSJEW
PUBLISHER: Ceramic Society of Japan
DOCUMENT TYPE: Journal
LANGUAGE: Japanese

AB The behavior of solid oxide electrolysis cells (SOEC) was investigated as compared with that of solid state **fuel cell** (SOFC) using small cells proposed on yttria **stabilized zirconia** (YSZ) planar disks. Ni-YSZ **cermet** neg. electrode showed asym. behavior indicating the existence of diffusion limited process in the electrolysis direction, although the behavior was strongly dependent on the electrode prepn. The behavior of pos. electrodes made by using perovskite type oxides was also investigated. When polarized anodically, the pos. electrode showed degrdn. behavior which ended up with electrode delamination from electrolyte. The degrdn. rate was remarkably decreased by improving the initial polarization performance of the electrode or by using a mixed ceria intermediate layer between YSZ and electrode. Polarization measurements of SOEC were conducted at 1173 K, 1223 K and 1273 K with various water content in hydrogen simulating the atm. of various water electrolysis rate. The cell was shown to work at a high c.d. and at high electrolysis rate without suffering from diffusion limiting current.

AB The behavior of solid oxide electrolysis cells (SOEC) was investigated as compared with that of solid state **fuel cell** (SOFC) using small cells proposed on yttria **stabilized zirconia** (YSZ) planar disks. Ni-YSZ **cermet** neg. electrode showed asym. behavior indicating the existence of diffusion limited process in the electrolysis direction, although the behavior was strongly dependent on the electrode prepn. The behavior of pos. electrodes made by using perovskite type oxides was also investigated. When polarized anodically, the pos. electrode showed degrdn. behavior which ended up with electrode

delamination from electrolyte. The degrdn. rate was remarkably decreased by improving the initial polarization performance of the electrode or by using a mixed ceria intermediate layer between YSZ and electrode. Polarization measurements of SOEC were conducted at 1173 K, 1223 K and 1273 K with various water content in hydrogen simulating the atm. of various water electrolysis rate. The cell was shown to work at a high c.d. and at high electrolysis rate without suffering from diffusion limiting current.

IT Dielectric polarization
(polarization behavior of yttria-**stabilized zirconia** high-temp. solid oxide electrolysis cells)

IT Electrolytic cells
(yttria-**stabilized zirconia**; polarization behavior of yttria-**stabilized zirconia** high-temp. solid oxide electrolysis cells)

IT 7440-02-0, Nickel, processes 114168-16-0, Yttrium zirconium oxide (Y0.16Zr0.92O2.08)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(anode; polarization behavior of yttria-**stabilized zirconia** high-temp. solid oxide electrolysis cells)

IT 12016-86-3, Cobalt Lanthanum oxide colao3 110781-51-6, Lanthanum manganese strontium oxide la0.9mnsr0.1o3
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(cathode; polarization behavior of yttria-**stabilized zirconia** high-temp. solid oxide electrolysis cells)

IT **1306-38-3**, Cerium oxide (CeO2), processes
RL: PEP (Physical, engineering or chemical process); TEM (Technical or engineered material use); PROC (Process); USES (Uses)
(interlayer; polarization behavior of yttria-**stabilized zirconia** high-temp. solid oxide electrolysis cells)

IT 1314-23-4, Zirconium oxide (ZrO2), processes 64417-98-7, Yttrium Zirconium oxide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(solid electrolyte; polarization behavior of yttria-**stabilized zirconia** high-temp. solid oxide electrolysis cells)

IT 1314-36-9, Yttrium oxide (Y2O3), processes
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PRP (Properties); PROC (Process); USES (Uses)
(zirconium electrolyte **stabilized** by; polarization behavior of yttria-**stabilized zirconia** high-temp. solid oxide electrolysis cells)

L12 ANSWER 22 OF 40 CAPLUS

ACCESSION NUMBER: 1996:731899 CAPLUS
DOCUMENT NUMBER: 125:334164
TITLE: Solid electrolyte fuel cells and manufacture of the fuel cells
INVENTOR(S): Tamura, Moritoshi; Mizutani, Yasunobu; Kawai, Masayuki; Nomura, Kazuhiro
PATENT ASSIGNEE(S): Toho Gas Kk, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 6 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08250134	A2	19960927	JP 1995-83196	19950314

PRIORITY APPLN. INFO.: JP 1995-83196 19950314

AB The fuel cells have a La Sr manganate cathode bonded to a ZrO_2 based solid electrolyte, where the electrolyte is stabilized with Sc_2O_3 to suppress the diffusion of Mn ion from the cathode into the electrolyte. The fuel cells are prepd. by applying a Ni **cermet** anode material to 1 side of a scandia stabilized ZrO_2 electrolyte plate, applying a La Sr manganate cathode material to the other side of the electrolyte, and sintering.

AB The fuel cells have a La Sr manganate cathode bonded to a ZrO_2 based solid electrolyte, where the electrolyte is stabilized with Sc_2O_3 to suppress the diffusion of Mn ion from the cathode into the electrolyte. The fuel cells are prepd. by applying a Ni **cermet** anode material to 1 side of a scandia stabilized ZrO_2 electrolyte plate, applying a La Sr manganate cathode material to the other side of the electrolyte, and sintering.

ST **fuel cell** scandia zirconia electrolyte; cathode manganese diffusion prevention **fuel cell**

IT **Fuel-cell** electrolytes
(scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT Fuel cells
(solid-state, scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT 1314-23-4, **Zirconia**, uses **12060-08-1**, Scandia
111569-09-6, Scandium zirconium oxide 120605-82-5, Lanthanum manganese strontium oxide ($La_{0.85}MnSr_{0.15}O_3$)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT 7439-96-5, Manganese, miscellaneous
RL: MSC (Miscellaneous)
(scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

L12 ANSWER 23 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1996:731898 CAPLUS
DOCUMENT NUMBER: 125:334163
TITLE: Solid electrolyte fuel cells and manufacture of the fuel cells
INVENTOR(S): Tamura, Moritoshi; Mizutani, Yasunobu; Kawai, Masayuki; Nomura, Kazuhiro
PATENT ASSIGNEE(S): Toho Gas Kk, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08250135	A2	19960927	JP 1995-83197	19950314

PRIORITY APPLN. INFO.: JP 1995-83197 19950314

AB The fuel cells have a La Sr manganate cathode bonded to a ZrO_2 based solid electrolyte, where the electrolyte is stabilized with Sc_2O_3 and contains Al_2O_3 and the diffusion of Mn ion from the cathode into the electrolyte is suppressed by reacting with Al_2O_3 in the intergranular boundary in the electrolyte. The fuel cells are prepd. by applying a Ni **cermet** anode material to 1 side of an Al_2O_3 contg. scandia stabilized ZrO_2 electrolyte plate, applying a La Sr manganate cathode material to the other side of the electrolyte, and sintering.

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Al_2O_3 and the diffusion of Mn ion from the cathode into the electrolyte is suppressed by reacting with Al_2O_3 in the intergranular boundary in the electrolyte. The fuel cells are prepd. by applying a Ni **cermet** anode material to 1 side of an Al_2O_3 contg. scandia stabilized ZrO_2 electrolyte plate, applying a La Sr manganate cathode material to the other side of the electrolyte, and sintering.

ST **fuel cell** alumina scandia zirconia electrolyte; cathode manganese diffusion prevention **fuel cell**

IT **Fuel-cell** electrolytes
(alumina in scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT Fuel cells
(solid-state, alumina in scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT 1314-23-4, **Zirconia**, uses **1344-28-1**, Alumina, uses **12060-08-1**, Scandia 111569-09-6, Scandium zirconium oxide 120605-82-5, Lanthanum manganese strontium oxide ($La_{0.85}MnSr_{0.15}O_3$)
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(alumina in scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

IT 7439-96-5, Manganese, miscellaneous
RL: MSC (Miscellaneous)
(alumina in scandia **stabilized zirconia** electrolyte for preventing diffusion of manganese ion from cathodes in fuel cells)

L12 ANSWER 24 OF 40 CAPLUS

ACCESSION NUMBER: 1996:580178 CAPLUS
DOCUMENT NUMBER: 125:252928
TITLE: Manufacture of lateral tubular solid electrolyte fuel cells
INVENTOR(S): Takatsuki, Seiji; Kudome, Osao; Kanzaki, Junichi; Tsukuda, Hiroshi; Hashimoto, Tsutomu
PATENT ASSIGNEE(S): Mitsubishi Heavy Ind Ltd, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08185882	A2	19960716	JP 1994-326990	19941228

PRIORITY APPLN. INFO.: JP 1994-326990 19941228

AB The fuel cells are prepd. by a slurry coating-sintering method, where an anode slurry and an electrolyte are coated on a presintered porous substrate tube, sintering the 2 layers simultaneously to form the anode and a dense electrolyte layer, and forming a cathode on the electrolyte layer by slurry coating-sintering or melt spraying. The interconnector may be prepd. along with the anode and electrolyte layer or along with the cathode. The substrate tube is preferably CaO stabilized ZrO_2 contg. NiO or CeO_2, the anode is NiO mixed with Y_2O_3 stabilized ZrO_2 or $MgAl_2O_4$, the cathode a perovskite oxide $La_xM_{1-x}M1O_3$ (M = Sr, Ca, or Ba; M1 = Mn or Co), and the interconnector is a perovskite oxide $La_xM2_{1-x}CrO_3$ (M2 = Sr, Ca, or Ba), when prepd. by slurry coating-sintering, or a **cermet** of a heat resistant Ni-Al or Ni-Cr alloy and Al_2O_3 when prepd. by melt spraying.

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may be prepd. along with the anode and electrolyte layer or along with the cathode. The substrate tube is preferably CaO stabilized ZrO2 contg. NiO or CeO2, the anode is NiO mixed with Y2O3 stabilized ZrO2 or MgAl2O4, the cathode a perovskite oxide LaxM1-xM1O3 (M = Sr, Ca, or Ba; M1 = Mn or Co), and the interconnector is a perovskite oxide LaxM21-xCrO3 (M2 = Sr, Ca, or Ba), when prepd. by slurry coating-sintering, or a **cermet** of a heat resistant Ni-Al or Ni-Cr alloy and Al2O3 when prepd. by melt spraying.

ST solid electrolyte **fuel cell**; lateral tubular **fuel cell** manuf

IT 12013-47-7, Calcium zirconium oxide
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manuf. of lateral tubular solid electrolyte fuel cells with calcium **stabilized zirconia** substrate tubes contg. nickel oxide and ceria)

IT **111176-40-0**
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manuf. of lateral tubular solid electrolyte fuel cells with nickel-aluminum-alumina **cermet** interconnectors)

IT **1306-38-3**, Ceria, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manuf. of lateral tubular solid electrolyte fuel cells with substrate tubes contg. nickel oxide)

L12 ANSWER 25 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:372452 CAPLUS
DOCUMENT NUMBER: 125:173175
TITLE: Electrochemical thin films fabricated by an ambient plasma technique
AUTHOR(S): Williams, J. A. A.; Vuong, K. D.; Wu, V.; Schuesselbauer, E.; Wang, X. W.
CORPORATE SOURCE: Alfred University, Alfred, NY, 14802, USA
SOURCE: Ceramic Transactions (1996), 65(Role of Ceramics in Advanced Electrochemical Systems), 373-380
CODEN: CETREW; ISSN: 1042-1122
PUBLISHER: American Ceramic Society
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Results on electrochem. thin films fabricated by a radio-frequency plasma technique in an atm. environment are presented. This technique is a modified plasma spray process. Materials include yttria-**stabilized zirconia** (YSZ) and ceria for solid-oxide **fuel cell** (SOFC) electrolytes, NiO-YSZ **cermet** (SOFC anode), lanthanum strontium manganite (SOFC cathode), transparent conductive ITO for a variety of uses, manganese oxide and cobalt oxide for use in optical filters. Film d., thickness, and crystallite size can be controlled by altering deposition parameters to obtain films of different characteristics. This is advantageous to **fuel cell** fabrication where a dense electrolyte and porous electrodes are required. The obtained films were characterized by SEM, x-ray diffraction, EDS, SIMS, laser surface profiling, optical transmission-reflection, Moessbauer spectrometry, and at. force microscopy.

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characteristics. This is advantageous to **fuel cell** fabrication where a dense electrolyte and porous electrodes are required. The obtained films were characterized by SEM, x-ray diffraction, EDS, SIMS, laser surface profiling, optical transmission-reflection, Moessbauer spectrometry, and at. force microscopy.

ST electrochem thin film manuf ambient plasma; yttria **stabilized zirconia** electrolyte manuf plasma; ceria **stabilized** yttria electrolyte manuf plasma; **fuel cell** yttria **stabilized zirconia** electrolyte; nickel yttria **stabilized zirconia cermet** anode; lanthanum strontium manganite cathode manuf plasma; ITO film manuf ambient plasma; manganese oxide optical filter manuf plasma; cobalt oxide optical filter manuf plasma

IT 143107-06-6
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**cermet**; thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** anode)

IT 59707-46-9, Lanthanum manganese strontium oxide
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** cathode)

IT 51184-16-8, Cerium yttrium oxide 64417-98-7, Yttrium zirconium oxide
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** electrolyte)

IT **1306-38-3**, Ceria, processes 1314-23-4, **Zirconia**, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(yttria-**stabilized**; thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** electrolyte)

IT 1314-36-9, Yttria, processes
RL: PEP (Physical, engineering or chemical process); PROC (Process)
(**zirconia stabilized** by; thin films fabricated by ambient plasma technique for solid-oxide **fuel cell** electrolyte)

L12 ANSWER 26 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1996:288356 CAPLUS
DOCUMENT NUMBER: 124:321569
TITLE: Unit cells for solid electrolyte fuel cells
INVENTOR(S): Nakanishi, Naoya; Kadowaki, Seiten; Kawamura, Hiroyuki; Taniguchi, Shunsuke; Yasuo, Koji; Akyama, Yukinori; Saito, Toshihiko
PATENT ASSIGNEE(S): Sanyo Denki Kk, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 08050899	A2	19960220	JP 1995-78992	19950404

PRIORITY APPLN. INFO.: JP 1994-117171 19940530

AB The cells use fuel anodes composed of a metal, a ceramic, and a braze for wetting the metal and ceramic at the working temp. of the cells. The metal may be Ni; the ceramic may be ZrO2 stabilized with CaO, MgO, Y2O3, or Sc2O3, (CeO2)0.8X0.2 (X = Sm2O3, Y2O3, La2O3), PrOx (0 < x .ltoreq.3), or BaCe1-xMxO3-x (0 < x .ltoreq.0.3; M = Dy, Gd, Y, Sn, Yb, and/or Nd); and the braze may be Ti-Ni alloy, Ti-Mo alloy, Ti-Ni alloy, Ti-Ni-Mo alloy, Ti-Mo-Nb alloy, or Ni-Mo-Nb alloy having expansion coeff. 4-14 .times. 10-6.K-1, preferably 10.3-13.3 .times. 10-6.K-1.

ST nickel zirconia yttria anode **fuel cell**; braze wetting

agent **fuel cell** anode; solid electrolyte **fuel cell** anode

IT Cermets
(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT Solders
(brazes, braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT Anodes
(**fuel-cell**, braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 112721-99-0P
RL: DEV (Device component use); IMF (Industrial manufacture); PREP (Preparation); USES (Uses)
(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 1308-87-8, Dysprosium oxide 1313-97-9, Neodymium oxide 1314-36-9, Yttria, uses 1314-37-0, Ytterbium oxide 1332-29-2, Tin oxide 12064-62-9, Gadolinium oxide 12683-48-6 37255-95-1 51401-75-3, Molybdenum, nickel, titanium 67956-52-9 176534-60-4
RL: MOA (Modifier or additive use); USES (Uses)
(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 53096-50-7, Barium cerium oxide 130732-40-0, Cerium samarium oxide (Ce0.8Sm0.4O2.2) 151382-67-1, Cerium lanthanum oxide (Ce0.8La0.4O2.2) 174643-53-9, Cerium yttrium oxide (Ce0.8Y0.4O2.2) 174697-25-7, Praseodymium oxide (PrO0-3)
RL: TEM (Technical or engineered material use); USES (Uses)
(braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

IT 1305-78-8, Calcium oxide, uses 1309-48-4, Magnesium oxide, uses **12060-08-1**, Scandium oxide
RL: MOA (Modifier or additive use); USES (Uses)
(**zirconia stabilized** with; braze wetting agent for Ni contg. **cermet** anodes in solid electrolyte fuel cells)

ACCESSION NUMBER: 1996:34960 CAPLUS
DOCUMENT NUMBER: 124:92689
TITLE: Manufacture of anode for solid oxide fuel cells
INVENTOR(S): Matsuzaki, Yoshio
PATENT ASSIGNEE(S): Tokyo Gas Company, Ltd., Japan
SOURCE: U.S., 8 pp. Cont.-in-part of U.S. Ser. No. 900,231, abandoned.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 2
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 5474800	A	19951212	US 1993-136213	19931012
JP 05225987	A2	19930903	JP 1991-313543	19911101
JP 3215468	B2	20011009		

PRIORITY APPLN. INFO.:
JP 1991-176235 A 19910620
JP 1991-313543 A 19911101
US 1992-900231 B2 19920617

AB A dispersion of Ni particles which form the anode is ensured, coherence of the Ni or NiO particles when being annealed or when generating electricity is prevented, the adhesion of the anode to the solid electrolyte layer is good, the contact resistance is reduced, and the anode performance is improved. To form an anode on 1 surface of the central solid electrolyte layer, Ni or NiO and a soln. of an organometallic complex salt in an org.

solvent, from which is obtained thin films or minute particles of a solid electrolyte by thermal decompn., are blended, and the solvent is evapd. until a suitable viscosity is obtained. The slurry obtained in this manner is coated on the central solid electrolyte layer and this coated film is dried, annealed, and thermally decompd. to obtain a NiO-solid electrolyte or a Ni-solid electrolyte **cermet**.

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ST nickel oxide electrolyte anode **fuel cell**

IT Anodes
(**fuel-cell**, manuf. of nickel or nickel oxide and **stabilized zirconia**)

IT 1314-23-4P, **Zirconia**, uses
RL: DEV (Device component use); PNU (Preparation, unclassified); PREP (Preparation); USES (Uses)
(manuf. of solid oxide **fuel-cell** anode of nickel or nickel oxide and **stabilized**)

IT **1306-38-3**, Ceria, uses 1314-36-9, Yttria, uses
RL: MOA (Modifier or additive use); USES (Uses)
(manuf. of solid oxide **fuel-cell** anode of nickel or nickel oxide and **zirconia stabilized** with)

IT 1313-99-1, Nickel oxide (NiO), uses 7440-02-0, Nickel, uses
RL: DEV (Device component use); PEP (Physical, engineering or chemical process); PROC (Process); USES (Uses)
(manuf. of solid oxide **fuel-cell** anode of **stabilized zirconia** electrolyte and)

L12 ANSWER 28 OF 40 CAPLUS

ACCESSION NUMBER: 1995:417682 CAPLUS
DOCUMENT NUMBER: 122:192513
TITLE: Nickel-scandia **stabilized zirconia cermet** anodes for solid oxide fuel cells
INVENTOR(S): Mizutani, Yasunobu; Tamura, Moryoshi
PATENT ASSIGNEE(S): Toho Gas Kk, Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 9 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 07006768	A2	19950110	JP 1993-171207	19930617
JP 3351865	B2	20021203		

PRIORITY APPLN. INFO.: JP 1993-171207 19930617

AB The anodes are composed of a **cermet** contg. Ni and Sc_2O_3 stabilized ZrO_2. These anodes have high elec. cond. and low polarization.

TI Nickel-scandia **stabilized zirconia cermet** anodes for solid oxide fuel cells

AB The anodes are composed of a **cermet** contg. Ni and Sc_2O_3 stabilized ZrO_2. These anodes have high elec. cond. and low polarization.

ST **fuel cell** anode nickel **zirconia**; scandia **stabilized zirconia** nickel anode; cerment

zirconia nickel anode
IT Electric conductivity and conduction
(elec. cond. of **cermet** anodes contg. nickel and scandium oxide **stabilized zirconia**)
IT Anodes
(**fuel-cell**, **cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)
IT 1314-23-4, **Zirconia**, uses 7440-02-0, Nickel, uses
157979-54-9, Scandium zirconium oxide (Sc0.22Zr0.89O2.11)
RL: DEV (Device component use); USES (Uses)
(**cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)
IT **12060-08-1**, Scandia
RL: DEV (Device component use); MOA (Modifier or additive use); USES (Uses)
(**cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)
IT 161849-15-6
RL: DEV (Device component use); PRP (Properties); TEM (Technical or engineered material use); USES (Uses)
(**cermet** anodes contg. nickel and scandium oxide **stabilized zirconia** for solid electrolyte fuel cells)

ACCESSION NUMBER: 1994:275414 CAPLUS
DOCUMENT NUMBER: 120:275414
TITLE: Solid electrolyte fuel cells
INVENTOR(S): Okuo, Takayasu; Uchama, Futoshi; Tsukamoto, Koichi; Kaga, Yasuo; Horiuchi, Hideo; Kanazawa, Motoi
PATENT ASSIGNEE(S): Kogyo Gijutsuin, Japan; Nippon Kooteingu Kogyo Kk
SOURCE: Jpn. Kokai Tokkyo Koho, 7 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 06029024	A2	19940204	JP 1992-204220	19920709
JP 3057342	B2	20000626		

PRIORITY APPLN. INFO.: JP 1992-204220 19920709
AB The fuel cells have a Y2O3-stabilized ZrO2 (YSZ) electrolyte between a cathode and an anode, where the electrodes are porous heat resistant alloy or **cermet** selected from Ni-Cr-Al, Ni-Cr-Fe, Ni-Cr-Fe-Al, Ni-Cr-Al + YSZ, Ni-Cr-Fe + YSZ, and Ni-Cr-Fe-Al + YSZ. Another structure of the fuel cells has a substrate plate of tube composed of the above heat resistant material, and the plate of the tube may also serve an electrode. The electrolyte and the electrodes may be melt sprayed films. These fuel cells have low resistance and suppressed sepn. between the electrolyte, electrodes, and the support.
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ST solid electrolyte **fuel cell**
IT 1314-23-4, **Zirconia**, miscellaneous
RL: MSC (Miscellaneous)

(**stabilized**, electrolytes and supports from, for solid electrolyte fuel cells)
IT 64417-98-7, Yttrium zirconium oxide
RL: USES (Uses)
(**zirconia stabilized** with, electrolytes from, for solid electrolyte fuel cells)
IT 1314-36-9, Yttria, miscellaneous
RL: MSC (Miscellaneous)
(**zirconia stabilized** with, electrolytes from, for solid electrolyte fuel cells)
IT 1305-78-8, Calcia, miscellaneous **1344-28-1**, Alumina, miscellaneous
RL: MSC (Miscellaneous)
(**zirconia stabilized** with, substrate plates and tubes from, for solid electrolyte fuel cells)

L12 ANSWER 30 OF 40 CAPLUS

ACCESSION NUMBER: 1994:58570 CAPLUS
DOCUMENT NUMBER: 120:58570
TITLE: Manufacture of electrodes for solid-electrolyte fuel cells
INVENTOR(S): Okumura, Kyoshi; Yamamoto, Juzo; Fukui, Takehisa; Takeuchi, Shinji; Hatsutori, Masatoshi
PATENT ASSIGNEE(S): Fine Ceramics Center, Japan; Chubu Electric Power; Kansai Electric Power Co
SOURCE: Jpn. Kokai Tokkyo Koho, 10 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 05266892	A2	19931015	JP 1992-93516	19920318
JP 3117781	B2	20001218		

PRIORITY APPLN. INFO.: JP 1992-93516 19920318

AB The fuel anodes are manufd. by mixing aq. solns. contg. ions of Ni, Co, and/or Ru with sols contg. ZrO2 and/or Ce oxide, then heating the mixts. to form powders. Alternatively, the fuel anodes are manufd. by mixing aq. solns. contg. ions of Ni and/or Mg with sols contg. Y2O3 and/or ZrO2, then heating the mixts. to form powders. The air cathodes are manufd. by mixing aq. solns. contg. La, and Mg, Fe, Co, Ni, and/or Cr with sols contg. Zr2O and Ce oxides, then heating the mixts. to form powders. Alternatively, the cathodes are manufd. by mixing aq. solns. contg. ion of La, Mg, and Sr and/or Ca with sols contg. Y2O3 and ZrO2, then heating the mixts. to form powders.

ST nickel zirconia **cermet** battery cathode; cathode lanthanum manganese zirconium oxide; sol gel process cathode manuf; process sol gel anode manuf
IT Cermets
(nickel-zirconia base, manuf. of, sol-gel process, for **fuel-cell** anodes)
IT Cathodes
(**fuel-cell**, lanthanum manganese zirconium oxides, manuf. of, by sol-gel process)
IT Anodes
(**fuel-cell**, nickel-zirconia base cermets, manuf. of, by sol-gel process)
IT **1306-38-3P**, Cerium oxide (CeO2), uses
RL: PREP (Preparation); USES (Uses)
(samarium oxide-stabilized, cathodes contg., manuf. of, by sol-gel process, for fuel cells)
IT 1314-23-4P, **Zirconia**, uses

RL: PREP (Preparation); USES (Uses)
(**stabilized**, cathodes contg., manuf. of, by sol-gel process, for fuel cells)

IT 1305-78-8P, Calcium oxide, uses 1314-36-9P, Yttria, uses
RL: PREP (Preparation); USES (Uses)
(**zirconia stabilized** with, cathodes contg., manuf. of, by sol-gel process, for fuel cells)

L12 ANSWER 31 OF 40 CAPLUS

ACCESSION NUMBER: 1993:606979 CAPLUS
DOCUMENT NUMBER: 119:206979
TITLE: Ceramic materials for SOFC anode cermets
AUTHOR(S): Marques, R. M. C.; Frade, J. R.; Marques, F. M. B.
CORPORATE SOURCE: Ceram. Glass Eng. Dep., Univ. Aveiro, Aveiro, 3800, Port.
SOURCE: Proceedings - Electrochemical Society (1993), 93-4(Proceedings of the Third International Symposium on Solid Oxide Fuel Cells, 1993), 513-22
CODEN: PESODO; ISSN: 0161-6374
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Solid solns. based on Y2O3-stabilized ZrO2 (YSZ) doped with .ltoreq.10 mol% CeO2 or TiO2 were prepd. and characterized as potential ceramic constituents of anode cermets for solid-oxide fuel cells (SOFC). The CeO2-doped materials exhibit negligible electronic cond. when subjected to reducing conditions. The addn. of .apprx.10 mol% TiO2 to YSZ increases the electronic cond. of YSZ under the same reducing conditions. For the same concn. of mixed valence dopant, the addn. of TiO2 is more effective in promoting electronic cond. under reducing conditions, which contrasts with the smaller level of redn. achieved under such conditions, estd. from gravimetric measurements. Electronic defects with significantly different mobilities for the 2 dopants are formed during the redn. process. Based on the obtained results, the TiO2-doped YSZ materials are good candidates as anode **cermet** components for SOFC.

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ST ceramic material anode **cermet fuel cell**; solid oxide **fuel cell** anode **cermet**; yttria **stabilized zirconia** ceramic anode **cermet**; ceria doped yttria **stabilized zirconia** ceramic; titania doped yttria **stabilized zirconia** ceramic

IT Cermets
(anodes, yttria-**stabilized zirconia** ceramics for, ceria- or titania-doped, for fuel cells)

IT Electric conductivity and conduction
(of ceria- and titania-doped yttria-**stabilized zirconia** ceramics, oxygen partial pressure dependence in relation to)

IT Ceramic materials and wares
(**zirconia**, yttria-**stabilized**, ceria- or titania-doped, for anode cermets, for fuel cells)

IT Anodes
(**fuel-cell**, cermets, yttria-**stabilized**

zirconia ceramics for, ceria- or titania-doped)

IT 1314-23-4, **Zirconia**, uses
RL: USES (Uses)
(yttria-**stabilized**, ceria- or titania-doped, ceramics, for anode cermets, for fuel cells)

IT **1306-38-3**, Ceria, uses 13463-67-7, Titania, uses
RL: USES (Uses)
(**zirconia** doped with, yttria-**stabilized**, ceramics, for anode cermets, for fuel cells)

IT 1314-36-9, Yttria, uses
RL: USES (Uses)
(**zirconia stabilized** by, ceria- or titania-doped, ceramics, for anode cermets, for fuel cells)

L12 ANSWER 32 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1993:569130 CAPLUS
DOCUMENT NUMBER: 119:169130
TITLE: Activities of rare-earth-containing oxides as electrodes for oxide ion conductor
AUTHOR(S): Eguchi, Koichi; Inoue, Takanori; Setoguchi, Toshihiko; Arai, Hiromichi
CORPORATE SOURCE: Grad. Sch. Eng. Sci., Kyushu Univ., Kasuga, 816, Japan
SOURCE: Journal of Alloys and Compounds (1993), 193(1-2), 59-61
CODEN: JALCEU; ISSN: 0925-8388
DOCUMENT TYPE: Journal
LANGUAGE: English

AB The substitutional dissoln. of an appropriate dopant to CeO2 is effective in controlling ionic and elec. conductivities. The combination of La0.6Sr0.4Co0.98Ni0.02O3 electrode/(CeO2)0.8(SmO1.5)0.2 electrolyte exhibited high electrode polarization cond. Anodic properties were evaluated in relation to an electrolyte material and oxide material in an Ni-based **cermet** anode.

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ST rare earth contg oxide electrode cond; lanthanum nickel strontium cobaltate electrode cond; cerium samarium oxide electrolyte cond; nickel **cermet** based anode cond; **fuel cell** electrolyte

IT **Fuel-cell** electrolytes
(rare earth-contg. oxides)

IT Anodes
(**fuel-cell**, nickel-base)

IT 1314-36-9, Yttrium oxide (Y2O3), properties
RL: PRP (Properties)
(electrolyte from **zirconia stabilized** with, with cobalt lanthanum nickel strontium oxide or lanthanum manganese strontium oxide electrodes, elec. cond. in relation to)

IT **1306-38-3**, Cerium dioxide, properties
RL: PRP (Properties)
(electrolyte, samarium oxide-doped, with cobalt lanthanum nickel strontium oxide electrode, elec. cond. in relation to)

IT 1314-23-4, **Zirconia**, properties
RL: PRP (Properties)
(electrolyte, yttria-**stabilized**, with cobalt lanthanum strontium nickel oxide or lanthanum manganese strontium oxide electrodes, elec. cond. in relation to)

L12 ANSWER 33 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1993:499829 CAPLUS
DOCUMENT NUMBER: 119:99829

TITLE: Sputter-deposited medium-temperature solid oxide fuel cells with multi-layer electrolytes

AUTHOR(S): Wang, L. S.; Barnett, S. A.
CORPORATE SOURCE: Department of Materials Science and Engineering, Northwestern University, Evanston, IL, 60208, USA

SOURCE: Solid State Ionics (1993), 61(4), 273-6
CODEN: SSIOD3; ISSN: 0167-2738
DOCUMENT TYPE: Journal
LANGUAGE: English

AB The deposition, interfacial impedance, and characteristics of solid oxide fuel cells (SOFC) with thin-film multi-layer electrolytes are described. Layers of 1 .mu.m thick Ag-YSZ (Y2O3-stabilized ZrO2) **cermet** cathode, 15-20 .mu.m thick electrolyte, and a 1-2.5 .mu.m thick Ni-YSZ anode were deposited on porous Al2O3 by reactive magnetron co-sputtering of metal targets in Ar-O mixts. The effect of adding Y-stabilized Bi2O3 (YSB) and Y-doped CeO2 (YDC) layers at the YSZ electrolyte surfaces was investigated. The open circuit voltage of the H/H2O (3%), Ni-YSZ/electrolyte/Ag-YSZ, air fuel cells tested at 750.degree. was 0.78-0.85 V, less than expected theor., indicating some porosity in the electrolyte layers. The cell resistance was 4.5 .OMEGA.-cm2 for a YSZ electrolyte, due mainly to the electrode interfacial resistance, and the max. power d. was 35 mW/cm2. Adding a 60 nm-thick YSB layer at the YSZ/Ag-YSZ interface reduced the air electrode resistance from .apprxeq.1.4 to 0.45 .OMEGA.-cm2, leading to an increase in the max. power d. to .apprxeq.50 mW/cm2. Adding a 100 nm-thick YDC layer at the Ni-YSZ/YSZ interface further increased the max. power d. to 110 mW/cm2 at a cell resistance of 1.6 .OMEGA. cm2. The three-layer YSB/YSZ/YDC electrolyte thus resulted in a factor-of-three increase in power d. over a YSZ electrolyte.

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ST solid oxide **fuel cell** multilayer electrolyte

IT **Fuel-cell** electrolytes
(yttria-**stabilized zirconia**, sputter deposited thin-film multilayer, performance of)

IT 1304-76-3, Bismuth oxide (Bi2O3), uses **1306-38-3**, Cerium dioxide, uses 1314-23-4, **Zirconia**, uses
RL: USES (Uses)
(yttria-**stabilized**, electrolyte, multi-layer, sputter-deposited medium-temp. solid oxide fuel cells with)

IT 1314-36-9, Yttria, uses
RL: USES (Uses)
(**zirconia stabilized** with, electrolyte, multi-layer, sputter-deposited medium-temp. solid oxide fuel cells with)

L12 ANSWER 34 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1993:499810 CAPLUS

DOCUMENT NUMBER: 119:99810

TITLE: Role of electrode interfacial resistances in the characteristics of sputter-deposited medium-temperature solid oxide fuel cells

AUTHOR(S): Wang, L. S.; Barnett, S. A.

CORPORATE SOURCE: Dep. Mater. Sci. Eng., Northwestern Univ., Evanston, IL, 60208, USA

SOURCE: Proceedings - Electrochemical Society (1993), 93-4(Proceedings of the Third International Symposium on Solid Oxide Fuel Cells, 1993), 649-55
CODEN: PESODO; ISSN: 0161-6374

DOCUMENT TYPE: Journal

LANGUAGE: English

AB The deposition, structure, interfacial impedance, and characteristics of solid oxide fuel cells (SOFC) with thin-film Y2O3-stabilized ZrO2 (YSZ) electrolytes are described. The cell layers, 1 .mu.m Ag-YSZ **cermet** cathode, 15-20 .mu.m electrolyte, and a 1-2.5 .mu.m Ni-YSZ anode were deposited on porous Al2O3 by reactive magnetron co-sputtering of metal targets in Ar-O mixts. In some cases, Y-stabilized Bi2O3 (YSB) and Y-doped CeO2 (YDC) layers were added at the electrolyte surfaces. The open circuit voltage of H/H2O (3%), Ni-YSZ/electrolyte/Ag-YSZ, air fuel cells tested at 750.degree. was 0.78-0.85 V, less than expected theor., indicating porosity in the YSZ layers. The cell resistance was 4.5 .OMEGA.-cm2 for a YSZ electrolyte, due mainly to the electrode interfacial resistance and the max. power d. was 35 mW/cm2. Adding a 60-nm-thick YSB layer at the YSZ/Ag-YSZ interface reduced the air electrode resistance from .apprxeq.1.4 to 0.45 .OMEGA.-cm2, leading to an increase in the max. power d. to .apprxeq.50 mW/cm2. Adding a 100-nm-thick YDC layer at the YSZ/Ni-YSZ interface further increased the max. power d. to 110 mW/cm2 at a cell resistance of 1.6 .OMEGA.-cm2. The three-layer YSB/YSZ/YDC electrolyte thus resulted in a factor-of-three increase in power d. over a YSZ electrolyte.

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ST solid oxide **fuel cell** deposition structure; sputter deposited solid oxide **fuel cell**; interfacial resistance solid oxide **fuel cell**

IT **Fuel-cell** electrolytes
(yttria-tabilized bismuth oxide and yttria-**stabilized** **zirconia** and yttria-**stabilized** ceria, sputter-deposited)

IT Sputtering
(reactive, solid oxide **fuel cell** fabrication by)

IT 149145-60-8, Silver, **zirconia**
RL: USES (Uses)

(cathodes of yttria-**stabilized**, sputter-deposited
medium-temp. solid oxide fuel cells with, characteristics of)

IT 1304-76-3, Bismuth oxide (Bi_2O_3), properties **1306-38-3**, Cerium dioxide, properties
RL: PRP (Properties)
(yttria-stabilized, electrolyte surface with layer of, sputter-deposited fuel cells with)

IT 1314-23-4, **Zirconia**, uses
RL: USES (Uses)
(yttria-**stabilized**, electrolyte, sputter-deposited medium-temp. solid oxide fuel cells with, characteristics of)

IT 1314-36-9, Yttria, uses
RL: USES (Uses)
(**zirconia stabilized** with, electrolyte, sputter-deposited medium-temp. solid oxide fuel cells with, characteristics of)

L12 ANSWER 35 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1993:476257 CAPLUS
DOCUMENT NUMBER: 119:76257
TITLE: An investigation of anode material and anodic reaction for solid oxide **fuel cell**
AUTHOR(S): Eguchi, Koichi; Setoguchi, Toshihiko; Okamoto, Kotaro; Arai, Hiromichi
CORPORATE SOURCE: Grad. Sch. Eng. Sci., Kyushu Univ., Kasuga, 816, Japan
SOURCE: Proceedings - Electrochemical Society (1993), 93-4(Proceedings of the Third International Symposium on Solid Oxide Fuel Cells, 1993), 494-503
CODEN: PESODO; ISSN: 0161-6374
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Anodic characteristics were investigated for Ni and Pt anodes. The anodic reaction on Ni is strongly affected by partial pressure of O (pO2) but not by the kind of fuel. The polarization cond. for Pt was sensitive to fuel and pO2, and significantly deteriorated in the presence of CO-CO2 mixt. as compared with H-H2O. The anodic polarization was also influenced by the oxide component in the **cermet**, as well as the metal. The effect of oxide component can be explained by activity for redox reaction and elec. cond.

TI An investigation of anode material and anodic reaction for solid oxide **fuel cell**

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ST anode characteristic solid oxide **fuel cell**; nickel **cermet** anode characteristic; platinum anode characteristic **fuel cell**

IT Anodes
(**fuel-cell**, nickel **cermet** and platinum, characterization of)

IT **66594-54-5** 148936-33-8 148936-79-2
RL: USES (Uses)
(anodes, polarization cond. of, elec. properties of oxide components in relation to)

IT 108916-21-8, Lanthanum manganese strontium oxide ($La_{0.6}MnSr_{0.4}O_3$)
RL: USES (Uses)
(cathodes, fuel cells contg., nickel **cermet** and platinum anodes in, characterization of)

IT 64417-98-7, Yttrium zirconium oxide

RL: USES (Uses)
(electrolyte, fuel cells contg., nickel **cermet** and platinum anodes in, characterization of)

IT 1314-23-4, **Zirconia**, uses
RL: USES (Uses)
(yttria-**stabilized**, electrolyte, fuel cells contg., nickel **cermet** and platinum anodes in, characterization of)

IT 1314-36-9, Yttria, uses
RL: USES (Uses)
(**zirconia stabilized** by, electrolyte, fuel cells contg., nickel **cermet** and platinum anodes in, characterization of)

L12 ANSWER 36 OF 40 CAPLUS

ACCESSION NUMBER: 1992:637143 CAPLUS
DOCUMENT NUMBER: 117:237143
TITLE: Effects of anode material and fuel on anodic reaction of solid oxide fuel cells
AUTHOR(S): Setoguchi, Toshihiko; Okamoto, Kotaro; Eguchi, Koichi; Arai, Hiromichi
CORPORATE SOURCE: Grad. Sch. Eng. Sci., Kyushu Univ., Kasuga, 816, Japan
SOURCE: Journal of the Electrochemical Society (1992), 139(10), 2875-80
CODEN: JESOAN; ISSN: 0013-4651
DOCUMENT TYPE: Journal
LANGUAGE: English

AB Anodic properties of solid oxide fuel cells have been evaluated for several anode/electrolyte systems. Anodic overvoltage of metal/Y2O3-stabilized ZrO2 (YSZ) interface was related with metal-O bonding strength and was the smallest for the Ni anode. The anodic polarization cond. of Ni-YSZ **cermet**/YSZ electrolyte interface strongly depended on O partial pressure in fuel, but was independent of the kind of fuel (H-H2O, CO-CO2, and CH4-H2O). The activation of O ion is the rate limiting step in the overall reaction. The overvoltages of Ni/ and Pt/Sm2O3-doped CeO2 (SDC) were very small as compared with those of Ni/ and Pt/YSZ. The anodic properties were also influenced by the oxide material mixed with Ni as a **cermet** component. The sequence of anodic polarization conductivities of Ni-oxide **cermet** systems was Ni-PrOx > Ni-SDC > Ni-YSZ.

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ST anode reaction solid oxide **fuel cell**

IT Fuel cells
(nickel-yttria-**stabilized zirconia**/yttria-**stabilized zirconia**/lanthanum strontium manganese oxide, performance of)

IT Anodes
(**fuel-cell**, metal oxide-**cermet** systems, properties of)

IT Electrolytic polarization
(interfacial, of nickel-yttria-**stabilized zirconia** anode/yttria-**stabilized zirconia** electrolyte interface in **fuel cell**)

IT 7439-89-6, Iron, properties 7439-96-5, Manganese, properties
7440-02-0, Nickel, properties 7440-05-3, Palladium, properties
7440-06-4, Platinum, properties 7440-16-6, Rhodium, properties
7440-18-8, Ruthenium, properties 7440-48-4, Cobalt, properties
7440-57-5, Gold, properties
RL: PRP (Properties)
(anodic properties of, **fuel cell** use in relation to)
IT 74-82-8, Methane, reactions
RL: RCT (Reactant); RACT (Reactant or reagent)
(reforming of, with steam, over nickel-yttria-**stabilized zirconia cermet**, for **fuel cell**)
IT **1306-38-3**, Ceria, properties
RL: PRP (Properties)
(samaria-doped, nickel composite with, anodic properties of)
IT 1314-23-4, **Zirconia**, uses
RL: USES (Uses)
(yttria-**stabilized**, nickel composite with, anodic properties of, **fuel cell** use in relation to)
IT 1314-36-9, Yttria, uses
RL: USES (Uses)
(**zirconia stabilized** with, nickel composite with, anodic properties of, **fuel cell** use in relation to)

L12 ANSWER 37 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1992:575082 CAPLUS
DOCUMENT NUMBER: 117:175082
TITLE: Anode materials for solid-oxide fuel cells
INVENTOR(S): Sawada, Akihiro; Tsuneyoshi, Kikuji
PATENT ASSIGNEE(S): Mitsubishi Heavy Industries, Ltd., Japan
SOURCE: Jpn. Kokai Tokkyo Koho, 8 pp.
CODEN: JKXXAF
DOCUMENT TYPE: Patent
LANGUAGE: Japanese
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 04121964	A2	19920422	JP 1990-238999	19900911
JP 2891528	B2	19990517		

PRIORITY APPLN. INFO.: JP 1990-238999 19900911
AB The materials are Ni-CeO2 cermets xNi.(1-x)CeO2 (x = 20-40 wt.%), and may contain (Y2O3-stabilized) ZrO2. The anodes have low reforming-related overpotential.
ST **fuel cell** anode **cermet**; nickel ceria
fuel cell anode; zirconia yttria ceria nickel anode
IT Anodes
(**fuel-cell**, nickel-ceria and nickel-ceria-(yttria-**stabilized**) **zirconia**)
IT **143683-35-6 143683-36-7 143683-37-8**
143683-38-9 143683-39-0 143776-78-7
143776-79-8 143776-80-1 143776-81-2
143776-82-3 143776-83-4 143776-84-5
143776-85-6 143776-86-7 143776-87-8
143776-88-9
RL: USES (Uses)
(anodes, for solid-electrolyte fuel cells)

L12 ANSWER 38 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN
ACCESSION NUMBER: 1991:167880 CAPLUS
DOCUMENT NUMBER: 114:167880
TITLE: High-temperature **fuel cell** for **fuel-cell** stacks

INVENTOR(S): Ivers-Tiffee, Ellen; Wersing, Wolfram
PATENT ASSIGNEE(S): Siemens A.-G., Germany
SOURCE: Ger. Offen., 7 pp.
CODEN: GWXXBX
DOCUMENT TYPE: Patent
LANGUAGE: German
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
DE 3922673	A1	19910124	DE 1989-3922673	19890710
DE 3922673	C2	19930617		

PRIORITY APPLN. INFO.: DE 1989-3922673 19890710

AB The (H-O) cell has (Y2O3-stabilized ZrO2) solid electrolyte foil, which is coated on each side with 1 electrode. The cells are gas-tightly sepd. by elec. conductive bipolar metal separator plates. The plates have gas channels. The electrodes are built of several sublayers of varying materials to provide a continuous transition between the thermal expansion coeff. of the electrolyte foil and the bipolar plate and to prevent mech. stresses or failure during the **fuel-cell** operation.
The anode is ZrO2-Ni or CeO2-ZrO2-Ni **cermet** with increasing Ni concn. to the separator plate. The cathode is LaMnO3 whose La is replaced to varying extent with heavy alk. earth metals.

TI High-temperature **fuel cell** for **fuel-cell** stacks

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The anode is ZrO2-Ni or CeO2-ZrO2-Ni **cermet** with increasing Ni concn. to the separator plate. The cathode is LaMnO3 whose La is replaced to varying extent with heavy alk. earth metals.

ST **fuel cell** zirconia nickel anode; ceria zirconia nickel **cermet** anode; nickel zirconia ceria **cermet** anode; **cermet fuel cell** anode; cathode lanthanum manganate **fuel cell**

IT Fuel cells
(stacks, hydrogen/oxygen, with yttria **stabilized zirconia** electrolyte)

IT 55267-07-7, Nickel, zirconium **133195-72-9**
RL: USES (Uses)
(anodes, for **fuel-cell** stacks with yttria-**stabilized zirconia** electrolyte)

IT 108916-09-2, Cobalt lanthanum strontium oxide (CoLa0.8Sr0.2O3)
108916-22-9, Lanthanum manganese strontium oxide (La0.8MnSr0.2O3)
133340-05-3
RL: USES (Uses)
(cathodes, for **fuel-cell** stacks with yttria-**stabilized zirconia** electrolyte)

L12 ANSWER 39 OF 40 CAPLUS
ACCESSION NUMBER: 1990:409389 CAPLUS
DOCUMENT NUMBER: 113:9389
TITLE: A new solid oxide **fuel cell** design based on thin film electrolytes
AUTHOR(S): Barnett, S. A.
CORPORATE SOURCE: Dep. Mater. Sci. Eng., Northwestern Univ., Evanston, IL, 60208, USA
SOURCE: Energy (Oxford, United Kingdom) (1990), 15(1), 1-9
CODEN: ENEYDS; ISSN: 0360-5442

DOCUMENT TYPE: Journal
LANGUAGE: English

AB A novel solid oxide **fuel cell** (SOFC) design that can be fabricated entirely using low-temp., thin-film processing is described. The crit. design feature is the use of thin (.apprx.50 nm), catalytically active oxide layers on a <10 .mu.m thick Y2O3-stabilized ZrO2 supported electrolyte to minimize reaction overpotentials and ohmic losses. Doped CeO2 at the fuel electrode side and doped Bi oxide at the O electrode side are proposed for the surface layers. The surface reaction rates and overall electrolyte conductance in this design are high enough at <750.degree. to allow efficient SOFC operation. The operating temp. is low enough that low-resistance, thin-film metal electrodes, Ni at the fuel side and Ag at the O side, can be used to provide low ohmic losses. The overpotential behavior of the proposed cell was estd. from literature data and leads to fuel efficiency >50% at a power d. of .apprx.0.5 W/cm2 when operated at 750.degree..

TI A new solid oxide **fuel cell** design based on thin film electrolytes

AB A novel solid oxide **fuel cell** (SOFC) design that can be fabricated entirely using low-temp., thin-film processing is described. The crit. design feature is the use of thin (.apprx.50 nm), catalytically active oxide layers on a <10 .mu.m thick Y2O3-stabilized ZrO2 supported electrolyte to minimize reaction overpotentials and ohmic losses. Doped CeO2 at the fuel electrode side and doped Bi oxide at the O electrode side are proposed for the surface layers. The surface reaction rates and overall electrolyte conductance in this design are high enough at <750.degree. to allow efficient SOFC operation. The operating temp. is low enough that low-resistance, thin-film metal electrodes, Ni at the fuel side and Ag at the O side, can be used to provide low ohmic losses. The overpotential behavior of the proposed cell was estd. from literature data and leads to fuel efficiency >50% at a power d. of .apprx.0.5 W/cm2 when operated at 750.degree..

ST **fuel cell** thin film electrolyte

IT 112721-99-0
RL: USES (Uses)
(anodes, **fuel cell** design based on thin-film electrolyte and)

IT 1304-76-3, Bismuth oxide (Bi2O3), uses and miscellaneous
RL: USES (Uses)
(barium-stabilized, **fuel cell** design based on thin-film electrolyte and layer of)

IT 7440-39-3, Barium, uses and miscellaneous
RL: USES (Uses)
(bismuth oxide stabilized with, **fuel cell** design based on thin-film electrolyte and layer of)

IT 127637-84-7, Silver, yttria, zirconia
RL: USES (Uses)
(cathodes of **cermet**, **fuel cell** design based on thin-film electrolyte and)

IT 7440-54-2, Gadolinium, uses and miscellaneous
RL: USES (Uses)
(ceria doped with, **fuel cell** design based on thin-film electrolyte and layer of)

IT **1306-38-3**, Ceria, uses and miscellaneous
RL: USES (Uses)
(gadolinium-doped, **fuel cell** design based on thin-film electrolyte and layer of)

IT 1314-23-4, **Zirconia**, uses and miscellaneous
RL: USES (Uses)
(yttria-**stabilized**, thin-film electrolytes, **fuel cell** design based on)

IT 1314-36-9, Yttria, uses and miscellaneous
RL: USES (Uses)
(**zirconia stabilized** with, thin-film electrolytes,

fuel cell design based on)

L12 ANSWER 40 OF 40 CAPLUS COPYRIGHT 2003 ACS on STN

ACCESSION NUMBER: 1988:78662 CAPLUS
DOCUMENT NUMBER: 108:78662
TITLE: Sulfur-tolerant composite **cermet** electrodes for solid oxide electrochemical cells
INVENTOR(S): Isenberg, Arnold O.
PATENT ASSIGNEE(S): Westinghouse Electric Corp., USA
SOURCE: U.S., 9 pp.
CODEN: USXXAM
DOCUMENT TYPE: Patent
LANGUAGE: English
FAMILY ACC. NUM. COUNT: 1
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 4702971	A	19871027	US 1986-867860	19860528
EP 253459	A2	19880120	EP 1987-300648	19870126
EP 253459	A3	19881214		
EP 253459	B1	19930512		
R: BE, DE, FR, GB, IT, SE				
CA 1291788	A1	19911105	CA 1987-528139	19870126
JP 62281271	A2	19871207	JP 1987-65539	19870318
JP 2779445	B2	19980723		
US 4812329	A	19890314	US 1987-72834	19870713

PRIORITY APPLN. INFO.: US 1986-867860 19860528

AB A **fuel cell** has an anode bonded to the exterior of a tubular, solid, O2-conducting electrolyte which is also in contact with an interior cathode, and the anode comprises particles of an electronic conductor contacting the electrolyte, with a ceramic-metal oxide coating partially surrounding the particles and bonded to the electrolyte, and a coating of an ionic-electronic conductive material attached to the ceramic-metal oxide coating and to the exposed portions of the particles. Thus, a tubular **fuel cell** was prepd. by using a 2-mm-thick porous CaO-stabilized ZrO2 support tube with a 1-mm-thick 40% porous air cathode of doped La manganite on top of the support tube, and a 50-.mu. (ZrO2)0.90(Y2O3)0.10 electrolyte on the cathode. A 100-.mu. 50% porous layer of .apprx.5-.mu. Ni powder was deposited over the electrolyte by slurry dipping and a 1-5-.mu. skeleton of Y2O3-stabilized ZrO2 was deposited around the Ni powder layer to form a ZrO2-reinforced Ni **cermet** anode. The anode was impregnated with a satd. soln. of nitrates of Ce and La, which decompd. into (CeO2)0.8(La2O3)0.2 when heated. When operated at 900 and 1000.degree. using a H-3% H2O fuel, this cell had higher output voltage than a cell using an non-impregnated anode. The structure of the anode of the invention can also be used for electrodes in solid-state electrolyzers and gas sensors.

TI Sulfur-tolerant composite **cermet** electrodes for solid oxide electrochemical cells

AB A **fuel cell** has an anode bonded to the exterior of a tubular, solid, O2-conducting electrolyte which is also in contact with an interior cathode, and the anode comprises particles of an electronic conductor contacting the electrolyte, with a ceramic-metal oxide coating partially surrounding the particles and bonded to the electrolyte, and a coating of an ionic-electronic conductive material attached to the ceramic-metal oxide coating and to the exposed portions of the particles. Thus, a tubular **fuel cell** was prepd. by using a 2-mm-thick porous CaO-stabilized ZrO2 support tube with a 1-mm-thick 40% porous air cathode of doped La manganite on top of the support tube, and a 50-.mu. (ZrO2)0.90(Y2O3)0.10 electrolyte on the cathode. A 100-.mu. 50% porous layer of .apprx.5-.mu. Ni powder was deposited over the electrolyte by slurry dipping and a 1-5-.mu. skeleton of Y2O3-stabilized ZrO2 was deposited around the Ni powder layer to form a ZrO2-reinforced Ni

cermet anode. The anode was impregnated with a satd. soln. of nitrates of Ce and La, which decompd. into $(CeO_2)_{0.8}(La_2O_3)_{0.2}$ when heated. When operated at 900 and 1000.degree. using a H-3% H_2O fuel, this cell had higher output voltage than a cell using an non-impregnated anode. The structure of the anode of the invention can also be used for electrodes in solid-state electrolyzers and gas sensors.

ST **fuel cell cermet** anode; nickel zirconia ceria lanthania electrode

IT Electrodes
(yttria-**stabilized zirconia**-nickel, impregnated with lanthanum-doped ceria, for solid-state electrolyzers and gas sensors)

IT Anodes
(**fuel-cell**, yttria-**stabilized zirconia**-nickel, impregnated with lanthanum-doped ceria)

IT 7439-91-0, Lanthanum, uses and miscellaneous
RL: USES (Uses)
(ceria doped with, anodes impregnated with, yttria-**stabilized zirconia**-nickel, for fuel cells)

IT **1306-38-3**, Ceria, uses and miscellaneous
RL: USES (Uses)
(lanthanum-doped, anodes impregnated with, yttria-**stabilized zirconia**-nickel, for fuel cells)